Madras Exhibition of Raw Products, Arts, and Manufactures of Southern India,

1857.

REPORTS

BY

THE JURIES

ON

THE SUBJECTS IN THE THIRTY CLASSES INTO WHICH THE EXHIBITION WAS DIVIDED.

MADRAS:

Printed for the General Committee of the Madras Exhibition,

BY L. C. GRAVES, AT THE SCOTTISH PRESS, POPHAM'S BROADWAY.

1858.

The Right Honorable the Governor of Madras in Council, in Extract Minutes of Consultation, dated 15th August 1855, appointed an Exhibition of the Raw Materials, of the Machinery and Manufactures, and of the Sculptures, Models and the Plastic Art, of the Madras Presidency and the neighbouring States, to be held in the Banqueting Hall, Madras, 2nd February, 1857; and, in order to make generally known the wishes of Government regarding it, and to draw up a scheme of all the minor and subsidiary arrangements for carrying it out, nominated the following gentlemen to form a Committee.

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EXTRACT FROM THE RULES.

JURIES.

Juries will be composed of those Members of the General Committee forming the two Sub-Committees with such other Gentlemen as may hereafter be nominated.

The examination of the Articles exhibited and the decision with respect to the rewards to be given will be confided to the Juries.

The Jurors for the first 11 Classes will be nominated by the Sub-Committee for Raw Materials, and for the last 19 Classes by the Sub-Committee for Arts and Manufactures.

The General Committee will allot the Jurors amongst the various Classes, and will fix the General Rules which will serve as the basis for their operations.

Rewards will not be granted until after they have been revised by the Executive Committee.

Each Jury will be at liberty to call to its assistance, any persons acquainted with the Articles submitted to it for examination. These additional members or associates will only take part in the labours of the Jury as regards the particular object for which their services are required, they will only be entitled to take part in the discussion and not to vote.

The Juries will associate with themselves such residents of this place as may give them assistance as Sub-Reporters.

Such Exhibitors as have been appointed Jurors or Associates, will be held inelegible to receive a reward, for the particular class in which they have acted.

With a view of facilitating the labours of the Jurors, there be added to each Jury list a statement of the prizes which may be awarded by them in their class and the Jurors can also recommend the award of Medals when they consider such expedient.

Articles admitted after the commencement of the Juries labours, not allowed to compete for prizes.

REWARDS.

It is the intention of the General Committee that excellence should be rewarded in whatever form it is presented, and not to give inducements to the distinctions of a merely individual competition.

An ample fund has been allotted for money Prizes.

Two Classes of Medals will, also, be provided, to be awarded in such cases as may appear desirable.

The money prizes will be awarded with reference to the commercial character of the products and the Medals for excellence.

The two classes of Medals are intended to distinguish the respective characters of subjects and not as first and second in degree for the same class of subjects.

Articles from all countries will be admitted to the Madras Exhibition to be held in the beginning of 1857, and be allowed to compete for prizes; but, with a view to promote the good of this country, it is hereby notified that money prizes, medals, &c. will only be given for Articles capable of being applied in the Arts and Manufactures of India or calculated to be of use to its people.

Those manufactures consisting exclusively of native material, in all its stages, will receive the highest rewards.

For those products manufactured from imported materials smaller prizes will be given.

In the department of Raw Materials and Produce, prizes will be allotted upon a consideration of the value and importance, in a commercial point of view, of the article, and the superior excellence of the particular specimens exhibited: in the case of prepared materials coming under this head of the Exhibition, the Juries will take into account the novelty and importance of the prepared product and the superior skill and ingenuity manifested in the process of preparation.

In the department of Machinery, the Prizes will have reference to novelty in the invention, superiority in the execution, increased efficiency or increased economy, in the use of the Article exhibited.

The importance in a social or other point of view, of the purposes to which the Article is to be applied, will also be taken into consideration, as will, also, the amount of the difficulties overcome in bringing the invention to perfection.

Those Articles of Manufacture will be rewarded which fulfil in the highest degree the following conditions, viz., increased usefulness, such as permanency in dyes, improved forms and arrangements in articles of utility, &c., superior quality or superior skill in workmanship: new use of known materials, use of new materials, new combinations of materials as in Metals and Pottery: beauty of design in form or colour, or both, with reference to utility, cheapness relatively to excellence of production.

In the Department of Sculpture, Models and the Plastic Art, the rewards will have reference to the beauty and originality of the specimens exhibited, to improvements in the processes of production, to the applications of Art to Manufactures; and, in the case of Models, to the interests attaching to the subject they present.

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ALSO

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Bronzes, Marble, Alabaster, and Parian Statuettes, Plaster Casts, &c.

SUB-JURY.

G. Ellis, Esq.
Captain Hay.

Associate and Reporter.

A. Hunter, Esq., M.D.

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Tinnevelly.—C. J. Bird, Esq., C. H. Woodgate, Esq., Jugga Veera Rama Yettapah Naick Cottelinga Sathoo Royer, Coopchand, Tarachund, Meeranjee Meerah, Vasoodavoo, Balaram,

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Trichinopoly.—J. Bird, Esq., T. J. P. Harris, Esq., Colonel Wahab, Captain Russell, Captain Ford, Captain Cadell, Surgeon A. C. B. Neill, M.D.

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SPECIAL MEDALS OF THE FIRST CLASS.

FOR RANKS.

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His Highness the Nabob of Bunaganapillay.
His Highness the Nizam of Dekkan.
Nabob Salar Jung Bahadoor.
His Highness the Rajah of Cochin.
His Highness the Maha Rajah of Travancore.
His Excellency Tondiman Rajah Bahadoor.
General M. Cubbon, Commissioner of Mysore.
General W. Cullen, Commissioner of Travancore and Cochin.
The Zemindar of Vizianagram.
Colonel Davidson, Resident of Hyderabad.

FOR COLLECTIONS.

Bellary Local Committe.
M. Murray, Esq.
Travancore Local Committee,

FOR SERVICES.

R. Hurry Row.
Major P. T. Snow.
Hyderabad Local Committee.
Dr. Brandis.
Pondicherry Local Committee.
J. T. Maclagan, Esq.

MEDALS OF THE SECOND CLASS.

FOR REPORTS.

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FOR COLLECTIONS.

Nabob Salar Jung Bahadoor.
Captain Meadows Taylor.
Lientenant H. P. Hawkes.
Dr. Jesudasen, N. S.
Dr. F. Appavoo, N. S.
Mr. Bassano.
Mr. Pedre Proboo.
Kristna Chettiar.
Armooga Conar.

FOR SERVICES.

Nellore Local Committee.
A. T. Jaffrey, Esq.
Lieutenant Beddome.
Captain Dance.
B. Budriah.

JURY AWARDS.

CLASS I.

Mining, Quarrying, Metallurgical Operations, and Mineral Products.

1st CLASS MEDAL.

Progressive Number.	Names of Exhibitors.	Object rewarded.
8800	Edward Balfour, Esq..................................	Mineral Substances.

2nd CLASS MEDALS.

846 to 891	H. H. The Rajah of Vizianagram,..........	Ores of Manganese.
	G. Smith, Esq., M. D...........................	Series of Ores of Iron and Steel.

CLASS III.

Substances used for Food.

HONORABLE MENTION.

9063	Major Maitland,.....................	For grain.

CLASS IV.

Vegetable and Animal Substances, chiefly used in Manufactures, as Implements or for Ornaments.

SECTION 1.

Gums and Resins.

2nd CLASS MEDALS.

5979 to 5989	Madras Chamber of Commerce,.................	For a series of Resins, &c.
2320	M. Thwaites, Esq., of Ceylon,......	Doona Dammer.

HONORABLE MENTION.

8405	Claud H. Brown, Esq.,...........	For a series of lac Resins.
	E. B. Thomas, Esq.,.......	Vateria Resins.
7427	Mr. Pedro Proboo,...	A series of white Dammer.
2844 to 2850	Mr. Bassano,..................................	Pynee Varnish and botanical specimen.
160	Mr. Apothecary Huffton,.......	For Dikkamly.
	Rev. Mr. Johnson,...............................	Xanthoxylon triphyllum Resin.
5223	Armooga Moodely,..................................	Cashew Gum.
	E. J. Waring Esq.,..................................	For information given.

SFCTION II.

Oils.

2ND CLASS MEDALS.

Progressive Number.	Names of Exhibitors.	Object rewarded.
4550 to 4095	Hurry Row of Tanjore	Series of Oils.
5099 to 5110	W. D. Kohlhoff, Esq.	Do.

HONORABLE MENTION.

2025-2053, 2055	Bellary Commissariat	For best samples of Cocoanut, Gingeli and Safflower seed oil.
	G. Simth, Esq. M.D	For good sample of Castor and seed and for Rousa oil.
2074	H. Young, Esq., Nellore	For excellent samples of several oils.
7012 & 7013	Mr. Pedro Proboo	For best sample of Piney Tallow and Gamboge butter.

SECTION III.

Dyes and Colours.

2ND CLASS MEDALS.

8548	F. Appavoo Pillay, N. S.	Collection of dyes.
8405	C. H. Brown, Esq	Specimens of lac, lac dye, Shell lac, and seed lac.

HONORABLE MENTION.

4743	G. Fischer, Esq. of Salem,	Dyes.

SECTION V.

Vegetable Substances, Fibres.

2ND CLASS MEDALS.

4261	R. Hurry Row,	Fibre of the Agave.
1734	E. Ahobul Row,	Do.
6857	Messrs. Fischer and Co	Janapan Nar.

SECTION VI.

Timber and Ornamental Woods.

1ST CLASS MEDAL.

121 to 194	Monsieur H. de Querret, Sous Engineer Pondicherry	Collection of woods.

2ND CLASS MEDALS.

Progressive Number.	Names of Exhibitors.	Object rewarded.
272 to 374	Kristniah Chettiar—Palghat	Collection of woods.
3004 to 3037	Kristniah, Maramut Superintendent Coimbatore	Do.

HONORABLE MENTION.

2696 to 2756	W. Robinson, Esq., Acting Collector of Malabar..................	Collection of woods.
1239 to 1270	R. D. Parker, Esq., Collector of Madura.	Do.
6269 to 8296	Mr. McIvor, Superintendent Botanical Gardens, Ootacamund..................	Do.

SECTION VII.

Animal Substances.

2ND CLASS MEDAL.

813	Mr. J. C. Fitzgerald of Chingleput..........	Merino Wool.

HONORABLE MENTION.

	Government Sheep Farm, Mysore...	For Wools.

CLASS V.

Machines for direct use, including Carriages and Railway and Naval Mechanism.

2ND CLASS MEDALS.

8767	P. Orr, Esq.,..................	Self-Acting Punka.
3804 & 3805	F. L. Moncrieff, Esq.,..................	Crane and Crabs, &c.

HONORABLE MENTION.

7388	W. B. Wright, Esq., ...	Self-Acting Punka.
5029	R. Kennedy, Esq., ...	Do. do.
7929	H. Smith, Esq., ...	American Printing Press.

CLASS VI.

Manufacturing Machines and Tools.

1ST CLASS MEDALS.

9311	Captain Campbell,..................	Campbell Hammer.
9074 & 75	C. V. Cunniah Chettiar,..................	For Machines.

2ND CLASS MEDALS.

Progressive Number.	Names of Exhibitors.	Object rewarded.
	W. B. Wright, Esq.,	For aid in working Machines.
	Sub-Conductor Gage,	For Mills.

CLASS VII.

Civil Engineering, Architectural and Building Contrivances.

2ND CLASS MEDALS.

	Colonel A. Cotton	Wooden Suspension Bridge.
	Mr. Overseer Lever	Pump for clearing foundation by low-lifts.
	J. H. Dopping, Esq., C. Engr	Dopping's Shutter.

HONORABLE MENTION.

	Captain Farewell	Model of Kistna Anicut.
	W. Cadell, Esq	Model of South branch of lower Coleroon Anicut.

CLASS VIII.

Naval, Architectural and Military Engineering, Ordnance, Armour, and Accoutrements.

2D CLASS MEDALS.

8474 to 8547	The Right Honorable Lord Harris,	For a valuable collection of arms of all descriptions consisting of weapons in quality snperior to the description commonly found out of the possession of public Institutions.
9967	The Honorable W. Elliot Esq.,	For a collection of arms of great variety.
5033 to 5015	R. Burgass Esq.,	For a collection of arms of various countries
9311	Capt. Campbell,	For his models of carriage and Tilting Hammer.

HONORABLE MENTION.

56 to 72	From Kurnool,	Collection of arms.

CLASS X.

Philosophical Instruments and Processes depending upon their use, Musical, Horological and Surgical Instruments.

1ST CLASS MEDAL.

	Major W. K. Worster	For the invention of a Micrometer.

HONORABLE MENTION.

Progressive Number.	Names of Exhibitors.	Object rewarded.
6611	Hyderabad..................................	Universal Sun-Dial.

CLASS XI.

Textile Fabrics and Cotton Manufactures.

2ND CLASS MEDALS.

7871 Entered in the catalogue by mistake as Marool fibre.	W. E. Underwood, Esq.	Table cloth.
8391	Pitchica Ramalingum Chetty,...,...,.........	Cotton cloth, Rs. 26.
8400	Do. do. ....,......	Jean, Rs. 10.

HONORABLE MENTION.

2392	Gooroo Pariah,..................................	Punjum cloth, Rs. 100.
218 to 241	Pondicherry,..........	Table cloth and Napkins, &c.
8009	Name unknown,....................................	Towels.
9140	Mr. P. Martin,.......................................	Trowser cloth.
7145	German Mission,....................................	Table cloth.
8015	Chingleput Jail,....................................	Blue dyed Trowser cloth.

CLASS XII.

Woollen and Worsted.

2ND CLASS MEDALS.

	Tahsildar of Koodlagee Talook,......	Cumbly.
	Manufacturer of the worsted embroidered shawl,.................	Shawl.

CLASS XIII.

Silk and Velvet.

1ST CLASS MEDALS.

	W. E. Underwood, Esq........................	Pina Silk.
6228 and 6469	Hyderabad,.......................	Silks.
5175	Tanjore,........	Dress piece.

2ND CLASS MEDAL.

6088 and 6472	Hyderabad,.	Silks.

HONORABLE MENTION.

Progressive Number.	Names of Exhibitors.	Object rewarded.
6078	Hyderabad,	Silks.
6081	Do.	Do.
6064	Do.	Do.
6404	Do-	Satin.
4673	Tanjore,	Silk.
4677	Do.	Do.
5170	Do.	Do.
4234	Mysore,	Do.
4236	Do.	Do.
4751	Madura Parangody,	Silk Handkerchiefs.

CLASS XIV.

Manufactures from Flax and Hemp.

1st CLASS MEDALS.

	Captain Barrow	Fibres, &c.
6731	Dr. Riddell	Do.
	W. E. Underwood, Esq	Best fine fabrics.
	Secundrabad	Rope.

2nd CLASS MEDALS.

4668 to 4696	R. Hurry Row,	Fine Fabrics.
2369—2370	L. Paupiah	Very excellent gunnies.

CLASS XV.

Mixed Fabrics including Shawls, but exclusive of Worsted Goods.

2nd CLASS MEDALS.

4223	Naikjee Sookaram	Silk Shawl.
9087	Miss Tatham	Embroidered Silk Shawl.
778	Moonasee	Woman's cloth, silk and gold.

HONORABLE MENTION.

3217	Koday Tooljee	Silk shawl.
4216	Do.	Silk red quilt.
4218	Dondala Esorsee	do.
4222	Naikjee Sookaram	do.
4224	Meckjee Mungapah	do.
6338	Salar Jung Bahadoor	Mens and woman's cloth.
6601	Hyderabad Local Committee	do.
6023 } 6103 }	Hyderabad Local Committee	Saree or woman's cloth.
2007	G. Narrappah	do. with Lace border,

CLASS XVI.

Leather including Saddlery and Harness, Skins, Fur, Feathers, and Hair.

1st CLASS MEDAL.

Progressive Number.	Names of Exhibitors.	Object rewarded.
	Superintendent of Hoonsoor Pits, ...	Tanned skins.

2nd CLASS MEDALS.

9287	Bombadier J. Coglan,.........	Tanned Buffaloe and Bullock Hides.
8473	T. Taylor, Esq., of the Body Gaurd...	Military Saddle.

HONORABLE MENTION.

8564	Mr. Crowe,........................	Tanned Leather. &c.
6732	Dr. Francis Day,...............	Describing several processes of Bird preserving.

CLASS XVII.

Paper and Stationery, Printing and Book Binding.

1st CLASS MEDAL.

8650 to 8654	American Mission Press,...	Specimens of Printing and Binding.

CLASS XIX.

Tapestry including Carpets and Floor Cloths, Lac and Embroidery, Fancy and Industrial Works.

1st CLASS MEDALS.

4205	Kristniah, Mysore...............	Elephant jhools.
4262	Lutchmen Row, do.	do.
4195	Thunnagee Row, do.	Shameanah.
9089	W. E. Underwood, Esq.	Piece of gold Embroidery.
6690	Resident of Hyderabad..........	Work in Crimson and Gold,
1573	Tanjore Local Committee.........	Carpets. &c.
4114—4115	S. Nummiah......	Worsted Carpets.

2nd CLASS MEDALS.

4202	Venkojee Row.......	Palankeen cover.
5173	Tanjore Local Committee............	Carpets, &c.

MONEY PRIZES.

9043	Military Female Orphan Asylum,	25 0 0	Child's jaconet &c.
4262	Mrs. Sewell's School at Bangalore,	20 0 0	Collar, &c.
7405	Native Female Central School Madras	15 0 0	Collar, Lace, &c.

HONORABLE MENTION.

Progressive Number.	Names of Exhibitors.	Objected rewarded.
	Jewesses of Cochin...	Quilted Basinette cover.

CLASS XXI.

Cutlery and Edge Tools.

2ND CLASS MEDALS.

7361	W. B. Wright, Esq.......	For Smiths Tools &c.
5238 & 5239	Vellore Arsenal for maker,......	For Vices.
66 to 86	Arnachellum Ausary,...........	Knives &c.

CLASS XXII.

Iron and general Hardware.

2ND CLASS MEDALS.

	Overseer Lee of the Grand Arsenal, Fort St. George............	For locks.
4982	Serjeant Chalk, Gun Carriage Department,	Do.

HONORABLE MENTION.

5374 to 5577	Grand Arsenal of Fort St. George,...	General excellence in variety of articles [exhibited.
7352 to 7387	Locomotive Department and Workshops of the Madras Railway,.........................	,,
4778	Gun Carriage Manufactory,...	,,
	Dowlaishwarum Foundery and Workshops,.	,,
8729 to 8755	Artillery Depôt of Instruction,...............	,,
	Arsenal of Bangalore,..............	,,
5194	Arsenal of Vellore,..............................	,,
258	M. Bulliard of Pondicherry,.....................	Metallic cloth.
258	M. Godefroy do.	,,
4966	Sub Condr. Skinner,........	For general superiority of wokmanship.
4969	Serjeant Hayes,.................	,,

CLASS XXIII.

Working in precious Metals, Jewelry, and Articles of Virtue and Luxury, not included in other Classes.

1ST CLASS MEDAL.

8757	Messrs. Orr and Co.,..............................	Silver Vase.

2ND CLASS MEDALS.

Progressive Number.	Names of Exhibitors.	Object rewarded.
	Messrs. Lowe and Co.,...	A centre piece for a table representing a fountain with large pieces of coral lying at its base.
6827	J. Western, Esq,........	Native lamp in silver, &c.

CLASS XXV.

Ceramic Manufactures, China, Porcelain, Earthen-ware, &c.

2ND CLASS MEDALS.

5005	Serjeant M. Chesterfield,........	For considerable improvement in the Manufacture and Glazing of Pottery.
5064	Honorable W. Elliot, Esq.,.........	Strongest and best glazed Native Pottery.
	Mohomed Gouse Shereef,......	Best Native manufacture in Madras Presidency.

HONORABLE MENTION.

	Lieut. Puckle,.........	Best collection of Raw Materials.
	Raichore,......................................	General improvement in Pottery.
	Armooga Woodyar,...	Do. do.

CLASS XXVI.

Decorative Furniture and Upholstery, including Lacquered Goods.

2ND CLASS MEDALS.

	Lady Rawlinson.........	Carved Lotus flower stand.
7792 to 7806	J. Deschamp, Esq,..............................	For the number and variety of articles.
1 to 3	Nabob of Banaganapilly........................	Lacquered Ware.

CLASS XXVII.

Manufactures in Mineral Substances used for Building or Decoration, as in Marble, Slate, Porphyries, Cement, Artificial Stones, &c.

1ST CLASS MEDAL.

7444 to 7471	A. Hunter, Esq, M.D..........	For improved Building Material.

2ND CLASS MEDALS.

Progressive Number.	Names of Exhibitors	Object rewarded.
2338 to 2343	H. Newill, Esq., Guntoor...	For Marbles.
2541—2639	M. Murray, Esq., Cuddapah,...	Do,
261 to 263	M. Carriol, Pondicherry,...	For Hydraulic Lime.
	Lieut. James Puckle, Executive Engineer Dept. P. W. Mysore...	For the discovery of good roofing slates and whet slates near Bangalore and for the display of ornamental Porphyries and granites from the vicinity of Seringapatam and Mysore by the same contributor.

CLASS XXVIII.

Manufactures from Animal and Vegetable Substances not being woven or felted or included in other Sections.

2ND CLASS MEDALS.

8801 ?	Sedashoo of Vizagapatam...	Folding backgammon board and other materials.
	Maker of...	Sandal wood box and paper weight.
5117	Carver of...	Pith figure of Rajah of Tanjore.
6845	Carver of...	Pith group of three native gentlemen
3561 to 3564	Carver of...	Ivory Snake and four paper cutters.

CLASS XXIX.

Miscellaneous Manufactures and Small Wares.

1st CLASS MEDAL.

8801 to 8839	Sedashia...	Ivory and Horn Ware.

2d CLASS MEDALS.

3682 to 3981	Veerasawmy Naick...	Pith Work.
	T. Kistnah Row for the maker...	Do.

CLASS XXX.

Paintings, Drawings, Photographs and Engravings.

1ST CLASS MEDALS.

9077	George Latham, Esq...	Exceellent Architectural Drawings.
	Captain Tripe,...	Series of Callotypes.
	Captain Greenlaw,...	do. do.
	Dr. Scott,...	Photographs.
	Mrs. Col. J, R. Brown,...	Series of drawings.
	Dr. Murray...	Photographs.
	Capt. Simpson,...	Series of Views.
	Dr. Neill,...	Photographs.
	J. Mitchell, Esq...	Do.
	Major Mayne,...	Do.
	Dr. Mantell,...	Do.
	J. Rowe, Esq.,...	Do.

HONORABLE MENTION.

Progressive Number.	Names of Exhibitors.	Object rewarded.
	Right Honorable Lord Harris,................	Delhi Pictures.
	E. Maltby, Esq.,................................	Photographs.
	Col. Denison,...................................	Portrait of a Lady.

CLASS XXX.

Bronzes, Marble, Alabaster and Parian Statuettes, Plaster Casts, &c.

2ND CLASS MEDAL.

7620	Messrs. Griffiths and Co......................	Ornamental Flower Vases.

CLASS I.

REPORT ON MINING, QUARRYING. METALLURGICAL OPERATIONS AND MINERAL PRODUCTS.

Jury.

W. Burrell, Esq., *Superintending Surgeon, Centre Division, Chairman, and Joint Reporter.*
G. J. Shaw, Esq., m. d., *Assistant Assay Master, Madras Mint.*
A. J. Scott, Esq., m. d., *Assistant Assay Master.*
Alex. Hunter, Esq., m. d., *Director Madras School of Industrial Arts, Joint Reporter.*

Associates.

Honorable Walter Elliot, Esq., *Member of Council.*
B. Cunliffe, Esq., *Collector of Land Customs.*
J. Mitchell, Esq., *Lieut. and Adjut. 1st Native Vet. Battalion.*

The display of Mineral products is very large and contains many interesting and important collections of Raw materials, some of which are likely to prove of economic value. The marked improvement in the collections from several districts is very striking, and contrasts favorably with the contributions to the Exhibition of 1855. The care and attention bestowed upon the numbering and packing of the minerals from some districts, and the neat way in which others have been put up, are worthy of notice; amongst the largest collections are those from Hyderabad, Cuddapah, Bellary and Guntoor. The Minerals from Travancore, Pondicherry and Vizianagrum have been carefully named and neatly fitted up in boxes. Lieut. Puckle and Mr. Addis also send good collections from Bangalore. An interesting series of the Minerals collected on the first exploration of the Godavery under Lieut. Haig is contributed by Dr. Jackson, and similar series of the minerals from the first 60 miles of Railway cuttings from Madras towards Amoor are contributed by Mr. MacNair, Mr. Macmaster and Mr. Allan Wilson. These are of value as contributing exact local information regarding the mineral products of two recently explored tracts of country, and the Jury would point out the necessity for further careful investigations of this kind, wherever cuttings are made. It should however always be borne in mind by contributors, that there are two distinct characters in which minerals must be viewed, their economic, and scientific characters; for the former, correct labelling, with a statement as to quantity and facility of working on the spot, or carriage to the locality required may be sufficient, for the latter, when intended as merely Geological specimens, the accompanying rocks should be given, the position with regard to strike and dip of the rock, if raised from the horizontal, and the extent of the formation. The most interesting collections in an economic point of view are the Grinding, Polishing and Sharpening materials exhibited by Surgeon E. G. Balfour, and the collections from Hyderabad and Kurnool, the latter of which, though not large, consists almost entirely of substances useful in Manufactures. The most important Scientific collections are, the series of fossils of the green sand formations from Ootatoor by Mr. Rickets, a similar large collection of fossils of the same formation from Seedrapett, Vurdoor and Trivacarey by Mr. Arthur Hall, and the Gypsums, fossil woods, and limestone series from the Madras School of Arts. In order to facilitate the labors of the Jury, it was proposed, that the collection of minerals, which is very large and interesting, should be considered under different heads, as Metals, Alkaline and Earthy Minerals, Gems, Minerals useful in manufactures, Fossils.

METALS.

Gold.—Many districts in this Presidency are known to yield Gold, but not in such quantities as to prove remunerative, and only in small grains mixed with black sand, or in the dark red mud of nullahs. Two specimens are contributed by Lieut. Puckle from the vicinity of Bangalore, one in a matrix of dark blue quartz, and another in black sand, a sufficient quantity was procured to make a ring. A large, rough, coarse ruby, nearly two inches in length, exhibited by Mr. Lecot, has also some gold embedded in its substance. The gem is a curious and rare one, but full of flaws.

Silver.—A rich ore of silver or Argentiferous

Galena is exhibited from Martaban by Dr. Brandis. It is a peculiar looking Galena, being granular, or in minute crystals, with silver passing through it in thready veins. This ore has been carefully assayed by Dr. Scott: it contains about 80 per cent of silver lead. The quantity of silver was found to vary in the portion examined from 70 to 300 ounces in the ton of ore. It is impossible therefore to say what its commercial value may be, unless an average sample were obtained, but if the ore exists in any quantity and of the same quality as that examined, it is a most valuable one, and would be well worth working by Pattenson's mode for separating the silver, as the process proves remunerative where only 7 ounces of silver can be obtained from a ton of metal. This is the ore that is probably referred to by the Rev. Francis Mason, A. M., in his publication on the natural productions of Burmah.

LEAD CONTAINING SILVER.

The limestone of the Burmese Provinces probably contains large quantities of lead. In the valley of the Salwen, there is a rich vein of argentiferous galena, which is reported to appear on the surface. A specimen that Dr. Morton sent to England for analysis, was said to be a very valuable Mineral, and destined to make a fortune for some one. Professor Mitchell in the certificate that he furnished Dr. Morton of the analysis, says: It contains

Lead,	Lime,	} Carbonic Acid.
Sulphur,	Magnesia,	
Silver,	Iron,	
Gold, (traces)	Silica.	

It is a sulphuret of lead or galena. The quantity of lead and silver appears to be considerable, but there was not sufficient of the mineral to estimate either." The ore is seen in the limestone precisely as galena is found in the limestone of the Mississipi, one of the richest known deposits of lead in the world. Mr. O'Reiley states that the carbonate of lead exists near the head waters of the Hoimgdaran. The Galena of Jungunraz pilly near Cuddapah, of which a fine specimen was shown at the Exhibition of 1855, has only been procured in small quantities through Capt. Hemery; it has been examined by Dr. Scott.

Copper.—The display of Copper ores is very inferior to the collection made for the Great Exhibition in London of 1851. The ore is exhibited however from some new localities, but not in any great quantity. The green and liver colored oxides have been sent from Kurnool, Cuddapah and Nellore. The specimens sent from the Copper Mountain Bellary as rich liver colored Copper ore, have been carefully tested and do not contain a trace of Copper. They are rich Iron ores (Hæmatitic.)

ANTIMONY.

Sulphuret of Antimony or Soorma of good quality is exhibited from Vizianagrum. The substances sent as Soorma from Kurnool and Hyderbad are Galena or Sulphuret of Lead. Dr. Scott intimates that he has frequently tested the Soormas of the Bazaar and found that they do not contain Antimony but that they usually consist of Iron ores or Galena.

MANGANESE.

This metal occurs very abundantly in the Madras Presidency. Some very large samples of the silicated sesquioxide are exhibited by His Highness the Rajah of Vizianagrum, who contributes two tons in blocks weighing from 2 cwt. to 3 cwt. each. The Metal was carefully examined by Dr. Scott, who reported upon the contributions sent to the Exhibition of 1855 as containing from 53 to 54 per cent of metallic manganese. The substance is well suited for glazing Pottery, along with Galena, and Felspar. A great variety of pleasing colors can be imparted to the glaze by varying the proportions of the Manganese: thus, in small quantities it gives a yellow color, in large, brown, then a blood red, purple or black, as the proportion of Manganese is increased. It has also the property of hardening the glaze, so as to resist vinegar and weak Acids: concentrated mineral Acids however will corrode it. Specimens of Pottery glazed with this substance and of the colors above mentioned are exhibited in Class XXV. Experiments have also been tried with some of the ores of Manganese, which seem well suited for the manufacture of Chlorine and Chloride of lime. Manganese is used in small quantities by the Natives in giving purple, brown, and black colors to glass for Bangles. The Jury would recommend a 2d Class Medal to His Highness the Rajah of Vizianagrum for the fine samples of this ore exhibited, viz. Two Tons. Large samples have also been shipped to England for Report as to its applicability to manufacturing purposes. Some good samples of the same ore are forwarded from Kurnool, and Toomkoor in Mysore.

PEROXIDE OF MANGANESE.

This substance which occurs in the form of a compact black stone, with a smutty brown or black powder on the surface, is of more value than the preceding, being largely employed in manufacturing purposes. Good but small samples have been forwarded by the Bellary Local Committee from Soondoor, and from Roodrar in the Coilcoontlah Talook, Cuddapah: Also from Bimlipatam.

A specimen from the latter locality examined by Dr. Scott contains about 30 per cent of peroxide, which, although impure, would certainly be of some commercial value. Another specimen from Bellary was also found to contain a good deal of the Peroxide.

Brown wad and brown fibrous Manganese have been exhibited from the Red Hills, Bangalore and Cuddapah. It is to be regretted that the umber and other ores of Manganese which occur at the

Neilgherries are not contributed. Many of the Iron ores and Iron sands exhibited, contain Manganese, and the good quality of some of the Indian steel can be attributed to this admixture.

GALENA OR SULPHURET OF LEAD.

A rich ore of this kind from Martaban containing silver has already been noticed. Another locality from which Galena is exhibited is the Dhone Talook Kurnool, from which Galena in very large blocks has been obtained; one piece measured about 18 inches in diameter and weighed upwards of 3 Cwt. This ore was carefully tested by Dr. Scott some years ago, and was then found to contain from 53 to 70 per cent. of lead but no silver; some of the last consignments are found to be rich in silver: see Appendix. It was also tried at the Mint and yields a large per centage of Lead. It has been used for some years at the School of Arts for glazing Pottery, and answers well for that purpose, though it is found to succeed better when reduced to the form of minium, and then ground with Felspar and an Alkali. The raw galena only answers for the softest and commonest glazes, and the per centage of impurities mixed with this description, varies so considerably, that it has been found safer to reduce it from the state of Sulphuret to that of an oxide before applying it to the wares. Much of the Pottery from the School of Arts has been glazed with this Galena in different states. Galena is also known to occur at the Neilgherries and in two parts of the Cuddapah District. A good sample is exhibited amongst the Chemical substances, from Hyderabad, as Soorma; but this appears to have been purchased in the Bazaar.

CHROME ORE.

Very good samples of the Chromate of Iron are exhibited from Salem, Vizianagrum and Bangalore; but as yet nothing has been done to turn this mineral to useful account on a large scale in India, from the want of proper appliances. The great consumption of this substance in Europe is in the manufacture of Bichromate of Potass for dyes, the chromates of Lead for painting, and chromic acid for coloring Pottery, Porcelain and glass. The mineral was carefully tested some years ago, and a few ounces of the Bichromate of Potass and the yellow and orange Chromates of Lead were made in the School of Arts. The supply of Chrome Ore in Salem is said to be abundant, but the raw material will not pay the expense of freight, though the Chromates of Potass and Lead might be brought into use in dyeing and painting, if carefully manufactured in India. The Chrome ores used in England are obtained from the Shetland islands and Styria, where they are abundant. The quantity required for manufacturing purposes is not very large; hence the raw ores of India could never be brought into the English market so as to prove remunerative.

IRON ORES.

One of the richest departments of the Exhibition is the ores of iron and steel. Almost every district in the Presidency contributes specimens, and the collections from some localities are very extensive and varied; those from Cuddapah, Hyderabad, Bellary and Coimbatore are particularly deserving of notice. Large collections are also sent by Capt. Puckle and Mr. Addis from Bangalore, but the quality of the ores is not rich at that station. The principal ores of the Cuddapah district are the red, brown, and purple Hæmatites, which yield iron of excellent quality and very malleable. Some of the magnetic iron ores of the same district are particularly rich in iron, and a few of them contain traces of manganese. We would particularly notice amongst the Hæmatites those from Chemoor and Poolevendalah; the latter is magnetic although earthy and dull red in the fracture and bright red in the streak. The steel grey and granular iron ores from Chitwail, Camalapoor, and Goorumcondah are all rich in the metal and more or less magnetic. The yellow ochre and rusty ores of the Muddenpully Talook are said to yield good malleable iron. The steel grey iron sand of Comarole and Yendapully in the Doopaud Talook are highly magnetic and contain a little manganese.

The micaceous iron ore and iron glance of the Doopaud Talook are also rich in the metal.

The most prevalent iron ores of the Hyderabad territories seem to be the rusty brown, red, and yellow ochres; the iron or steel sands with manganese, and the specular or glance Ores: none of the latter however are magnetic. The red hæmatites marked Nos. 1 and 15 in the list are both rich in the metal. The rusty and yellow ores marked Nos. 2, 5, 9 and 13 are also of good quality. The steel grey ore No. 17-2 is of fine quality and the specular iron No. 4 is particularly rich in the metal, but not magnetic. The jaspery clay iron stone No. 6 is very like the clay iron stone exhibited amongst the coal measures from Burdwan and Scotland; it also appears to be associated with other minerals that accompany coal. The black, brown, and red Cellular iron ores are abundant in this collection, and a great deal of attention appears to have been bestowed on the minerals of this District and on the iron ores in particular. The Jury would recommend a 2nd class medal to Dr. Smith for the series of ores of iron and steel which were very carefully put up and numbered.

The Bellary District yields a variety of Iron ores, some of which are very rich in the metal and several of them associated with manganese. The prevailing ores of iron of this District are the black and grey Band Iron, alternating with sandstone; liver colored Hæmatite (which has been repeatedly sent to Madras as Copper Ore) and Red Jaspery Clay Iron stones. Some of the samples of Band Iron in sandstone are exceedingly like those thrown out of the Coal bags on the beach at Madras and vulgarly known in England as the pins and binders. They

are also associated in the same district and in the vicinity of Kurnool and Gooty with Magnesian Limestone, Grits, conglomerates, Aluminous shale. Fine Clay and Black Dolomite, minerals which usually accompany Coal ; but the Fossils which are the surest indications have still to be sought for. The jury are much pleased to find attention drawn to this point by Capt. Collyer of the Engineers, who has remarked the coincidence, and has sent samples of minerals from the Dhone Talook, Kurnool, and from the vicinity of Soondoor near Bellary, with a request that the minerals may be submittted to Mr. Wall the Government Coal and Mineral Viewer, who might be requested to visit the localities from whence the minerals have been procured.

See Report upon the minerals from Kurnool and Soondoor, which were submitted to the Jury and tested.

The Iron Ores sent by the Coimbatore Local Committee are of very fine quality, being particularly rich in the metal and the most highly magnetic in the Exhibition.

A Sub-Committee of the Jury carefully examined all the ores of Iron with the blow pipe, as to their magnetic properties, and the following was the result of these examinations.

Magnetic Iron Glance of fine quality occurs in Coimbatore, Salem, Cuddapah and Vellore.

Magnetic Hæmatites in Cuddapah.

Magnetic Iron sand also in Cuddapah ; none of the Iron sands of other districts magnetic.

Magnetic rusty Ochery Iron Ore at Palaveram and Hyderabad. None of the other Iron Ores of Hyderabad magnetic. No magnetic Iron Ores from Bellary, Masulipatam, Bangalore, Mysore, or other districts. Manganese detected in the Iron Ores of Hyderabad, Kurnool, Bellary, the Bababooden Hills, Mysore and Vizianagerum.

Meteoric Iron, or aerolites, are exhibited from Mysore and Pondicherry.

Micaceous Iron Ores of good quality from Cuddapah and Vizianagerum. Brown hæmatite and Reddle from the Red Hills, Bellary and Hyderabad. Common Iron Pyrites or Soornamooky stone is exhibited in Magnesian Limestone from Kurnool, Cuddapah and Gooty Radiated Pyrites in large pieces in black marble from Nundial and near Cuddapah. This is an important substance, and if procurable in large quantities, it might be used for the manufacture of sulphur, sulphuric acid, yellow and Red Ochres or polishing powder.

Iron Pyrites is also exhibited in small quantities in Aluminous shale from near Bangalore ; when it is found in large quantities in this Matrix, or if the Alum state be of a dark olive green with the sulphuret of Iron diffused through it, Alum may be prepared from it. For the process of preparing this substance, as followed in the Punjaub, see Report upon Alkaline and Earthy minerals.

REPORT UPON MINERALS SENT FROM KURNOOL, BY CAPT. COLLYER.

SUBMITTED TO JURY IN CLASS I. FOR EXAMINATION,

No. 1. *a.* Compact grey Magnesian Limestone, effervesces feebly with acid, calcines to a whitish color and is hydraulic.

No. 1. *b.* Yellowish grey silicious Magnesian Limestone, with Dendritic Manganese. Does not effervesce with acid. This is a whetstone and a hydraulic Lime.

No. 1. *c.* Dolomite or Blackish Magnesian Limestone ; Hydraulic, burns to a white, showing that carbon is the coloring material.

No. 1. *d.* Grey slate and dolomite. Fossils should be sought for in this stratum.

No. 2. *a.* Sandstones and Grits. The grey and black coloring matter is Plumbago or Carburet of Iron.

No. 2. *b.* Dark grey conglomerates with grains of Plumbago. It is not possible to determine the strata to which these belong without having fossils. The Plumbago remains unaltered by great heat.

No. 3. Galena or sulphuret of Lead with Felspar and sulphate of Baryta. Some of this is very rich in Lead containing from 53 to 70 per cent of Lead. This is the ore already described under the head of galena it has been practically examined by Mr. Wall and used for some years at the School of Arts for glazing Pottery. It is a very rich ore of lead and the last consignments contain silver.

No. 4. Clay slate tinged with Iron. This resembles Alum slate colored by Pyrites ; but on being tested, it is found not to contain sulphur.

No. 5. *a.* Quartz Pebbles.
b. Felspar Do. and
c. Felspar with brown spar or sulphate of Baryta.
d. Porphyry composed of all three.

MINERALS FROM SOONDOOR, BELLARY, DISTRICT, SENT BY CAPT. COLLYER.

1. *a.* Jaspery Clay Iron stone.
1. *b.* Sandstone with Iron ore. This is rich in Iron and resembles the Band Iron ore of England.
2. Grey and brown stalactitic Manganese, chiefly *sesquioxide.*
3. Iron Ore, Manganese and quartz.
4. Botryoidal sesquioxide and Peroxide of Manganese.
5. Red and yellow Clay Ironstone.
6. Jaspery Clay Ironstone. This borders on Transition formations and is often accompanied by Fossils.
7. *a.* Wrought Iron.
7. *b.* Yellowish aluminous shale.
8. Red Aluminous shale and Ochrey standstone.
9. Bastard Fire Clay and Band Iron. The for-

mer resembles the *Clunch* of the Coal formations, the latter the *Pins.*

10. Polier slate or Tripoli. This is not true Tripoli: it has been examined under the Microscope and does not contain any indications of Diatomaceae. Another fragment from the same locality sent by the Bellary Local Committee had all the appearance of containing vegetable matter in a Fossil state; it was carefully examined under the Microscope by Mr. Mitchell and Mr. Western, but no organic structure could be detected. The substance appears to be colored Koalin, or Porcelain Earth, accidentally striated in curved veins resembling Fossil wood.

11. Grey Iron Ore with a little Manganese.

12. White and red Quartz pebbles.

13. Yellow and brown wad or Manganese and iron, useful in coloring pottery.

14. Transition sandstone.

15. Transition Slate.

Fossils sometimes occur in the sandstones resting upon this slate.

It is impossible to determine the age of these formations without fossils.

The accompanying illustrated circulars on the Fossils of the New Red sandstone, Magnesian limestone, Carboniferous, Old Red sandstone and Silurian Strata may be of use in prosecuting further enquiries in the District.

See the end of the Report on Class I.

ALKALINE AND EARTHY MINERALS.

Southern India is particularly rich in this class of Mineral products, the origin of which seems to be the decaying granites of the country. The most common form of Alkali, is the Dhobee's Earth, a whitish grey, sandy efflorescence, which often covers miles of country where decayed white granite forms the surface soil; the earth contains from 13 to 25 per cent of Crude carbonate of soda and begins to accumulate in the dry weather immediately after the rains, it can be scraped off the surface to the depth of two or three inches, and by repeated boiling and the addition of a little quick lime, the alkali is obtained of considerable strength. With a little care very clean Carbonate of Soda can be obtained, fit for the manufacture of Toilet soap, white glass, and glazes for pottery. The crude earth in different states is exhibited from almost every district. The best samples of the prepared earth are exhibited by Bauloo Moodelly, who has frequently furnished it in large quantities for manufacturing purposes. The Nellore, Cuddapah, Masulipatam and Chingleput Districts yield this earth in great quantities, and repeated attempts have been made to prepare from it Barilla for exportation, and very fair specimens have been exported at different times, but the moderate price of the Carbonate of Soda of England prepared from Sea salt will always prevent this from being a remunerative article of export. The colored frits for Bangle glass, exhibited in another Class, have lately however become an article of export from this presidency.

Nitrate of Soda.—Samples of this Salt are exhibited from Bellary and Hyderabad where, it seems to form a natural efflorescence. Its chief use is as a substitute for saltpetre for the Manufacture of Nitric and other acids and chemical substances. It is too deliquescent for making gunpowder, though it answers well for some descriptions of fireworks. The samples exhibited are indifferent.

Muriate of Soda, mineral salt of very fair quality is exhibited from Bangalore, Bellary and Hyderabad, and is known to occur also in the Guntoor and Nellore Districts and to be almost invariably accompanied by some interesting minerals; viz., Gypsum, magnesian limestone, sandstone, sulphur, red and brown iron ores, and alum slate. As most of these minerals have come in from the Districts that produce the mineral salt, it would be worth while to direct further search to be made in the vicinity for the sulphur *and* alum slate, both of which are valuable products. Sulphur is exhibited from several Districts associated with the above and other combinations. Alum slate is also exhibited from the Cuddapah District, Vellore and the Neilgherries, but the accompanying minerals have not been forwarded. It is of great importance that the minerals associated with Rock Salt and Gypsum should always be recorded or collected, as Fossils of some kind or other almost invariably occur in the vicinity, and these are the best and safest guides for determining the relative ages of the accompaying strata. The following interesting description of the Salt Range in the Punjaub, by Dr. Jameson, will show the importance of this class of formations.

Salt Range, from the Eastern base of the Suliman Mountains to the River Jhelum in the Punjaub. Lat 32° 30′—33° 20′.

The rocks in this part of the range are, (first) Magnesian Limestone, 2, New Red Sandstone 3. Fossiliferous sandstone, 4, Red Clay and sandstone containing Coal and Mineral Sulphur, Rock Salt, Gypsum, brown and red Iron ore and Alum slate. The lower beds contain no organic remains but the upper abound in them. The Iron ore is a red or brown Hæmatite, so rich that in many places the needle of the compass becomes quite useless even at a considerable distance from the rocks, owing to their being highly magnetic, from the quantity of iron which they contain. The sandstone abounds with the exuviae of enormous animals, either Saurians or Sauroid fishes.

The Hills at Kala Bagh contain great quantities of Aluminous slate, from which Alum is obtained at various manufactories in that town. The slate, well sprinkled with water, is laid in alternate strata with wood, until the pile reaches a height of 25 to 30 feet; it is then lighted and the combustion continued for about twelve hours, in which time the color of the slate is converted from greyish black to dark red. This change of color indicating that the process has been carried to a sufficient extent, the mass is thrown into a tank holding as much water

as it is computed the Alum is competent to saturate. After three days the water, which becomes of a dark red color is drawn off, mixed with a due proportion of potash and boiled down. The residuum on cooling becoming a solid mass of Alum.

A very interesting series of salts, consisting chiefly of the Muriate and carbonate of soda from the Loonar Lake in the Hyderabad territories, is exhibited by Dr. George Smith, Residency Surgeon, Hyderabad. These have already been carefully examined by Professor Mayer and reported upon at some length in Vol. 1, New series of the Madras Journal of Literature and Science. The following is a condensed epitome of the Report and of the chemical composition of the salts.

No. 1. Dulla.

This is a Carbonate of Soda with a faint trace of Muriate of Soda and about 2 per cent of impurities.

No. 2. Nimmuck Dulla.

Is nearly pure Muriate of Soda.

No. 3. Khuppul.

Is carbonate of Soda, with water and about 2 per cent of impurities.

No. 4. Puppree.

Is nearly pure Carbonate of Soda.

No. 5. Madkhar.—This is an impure salt containing Carbonate of Soda,..... 27
Clay and sand,............ 30, water about 17.
Common Salt,............ 25

No. 6. Bhooskee.

This is also a crude impure substance,
containing Neutral Carb. of Soda. 26
Insoluble matter chiefly sand and Clay, 58
Water, ... 15
Common Salt, ... 2

No. 7. Travertin.

This contains Carb. of Lime,... ... 78
Carbonate of Magnesia, ... 4
Insoluble matter with Oxide of Iron &c. 9
Chloride of Sodium, ... 2
Water, ... 3

The Natron lake of Loonar occurs in the Circar of Meinker Soubah of Berar, about 45 miles N. W. of Hingolie, in Lat 20 N. It is about 510 feet below the level of the surrounding ground, in a kind of Crater of 5 miles in circumference; the lake being about 3 miles in circumference and surrounded by luxuriant vegetation; springs of clear soft water occur close to the lake, which has evidently been extending its bounds lately, as numerous dead trees are standing within its margin, and a bowric of sweet water, protected by a wall, is now completely surrounded by the water of the lake. An intolerable stench of sulphuretted hydrogen is emitted by the lake during the heat of the day, and its waters prove destructive to animal and vegetable life, though flocks of Duck and Teal dot the surface of its waters. There are two saline springs near the centre of the Lake, and about ½ a mile apart. These never become dry. It is supposed that the muriate of Soda from this source, coming in contact with the carbonate of Lime which abounds in the vicinity causes the deposition of the carbonate of Soda or Natron Salt in a greater or less state of purity. The depth of the lake near the salt springs varies from 6 feet during the hot months to 12 or 14 feet during the rains. The salt is raised by divers, who bring it up in their hands. It is much prized and finds a ready sale in both Berars, Nagpore, Candeish, and Poonah, to which places it is carried in Bamboo baskets and retailed by dealers. The Lake has not been regularly worked since 1836, in which year 2,136 candies of the different salts were raised, valued at Rs. 60,081. In 1853 Major Johnston rsised 35 candies, valued at Rs. 1,461-4-0.

Some suggestions have been proposed for increasing the productiveness and revenue of the lake. These are contrivances for preventing the flushing of the Lake with water, supplied by the main feeder, and by several streams from the surrounding water shed, such as bunds and channels.

Means for raising the salt with facility, and in due quantity, such as dredging machines.

Means for procuring the salts in greater purity, such as evaporating pans.

Means for procuring and preserving the salt raised, such as sheds, store rooms &c. with careful supervision by trustworthy Government officials.

The points to which the attention of the Exhibition Committee is solicited are :—

a. What is the exact Chemical composition of the salts?

This has been satisfactorily answered by Dr. Mayer.

b. What is their commercial value as now sent?

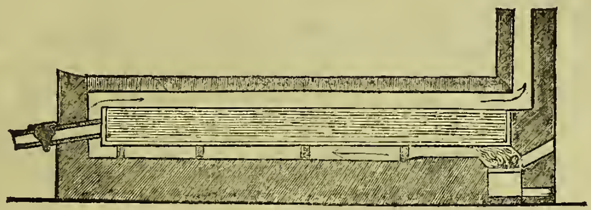
The commercial value of salts for exportation depends upon their purity and clean or white appearance: those marked No. 1, 3 and 4 might all be used in the manufactures of soap, glass, and glazes for pottery. They could not be exported profitably, as the carbonate of soda can now be so economically prepared in England from Sea salt, by Leblanc's process. The probability is, that, if the Natron or Barilla were more highly refined and crystallized, it might be used in India for the manufacture of plate glass, and for the better kinds of crown and window glass. Barilla sells for 8-6 to 9 shillings per cwt. fit for soap making, the qualities used for plate glass and for dyes are much more valuable.

c. Are the suggestions alluded to as under consideration correct in their general principles ?

The only questionable one appears to be the first, as it is doubtful whether it would be possible or desirable to prevent the flushing of the lake with fresh water.

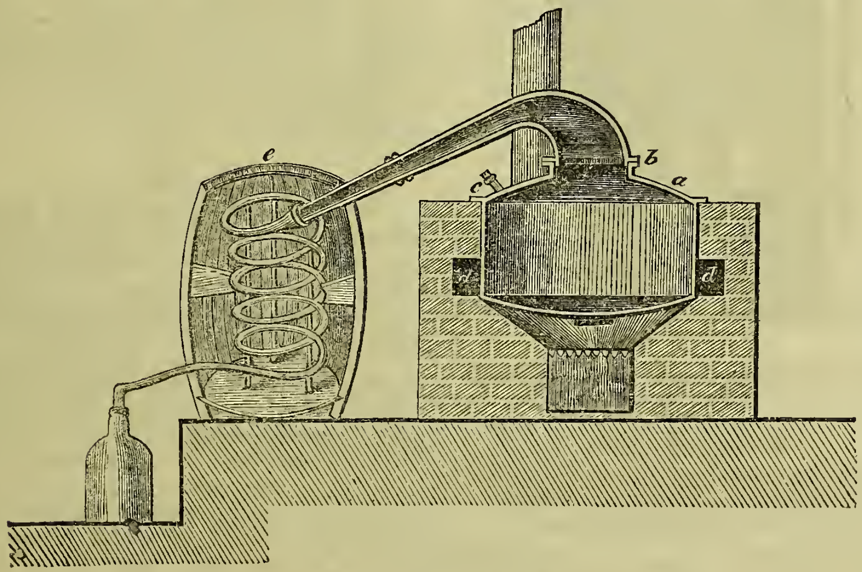
2. The only effectual means of raising the salt with facility and in large quantity would be by a dredging machine, worked by a crank handle and coolie labor, or by a steam engine. The cost of a suitable steam engine would be £550 to £600 and of a dredging machine to work in 8 to 12 feet of water £1,400 to £1,500.

3. The best means for procuring the salts in greater purity, would be to subject them to two boilings; first with pure soft water in an oblong evaporating pan, 12 to 15 feet long, 6 feet broad, and 1 foot deep, built of hard fired bricks made from a tough clay;



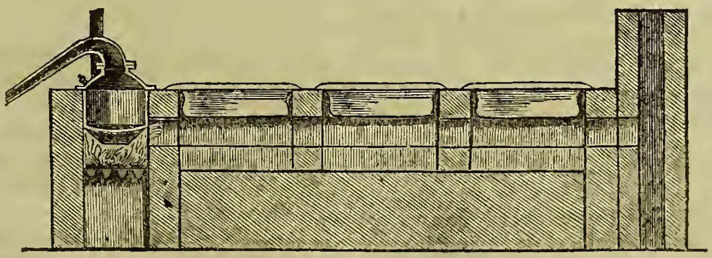
Evaporating pan.

from this pan the concentrated solution should be run out through woollen bags filled with sand and charcoal, and all covered with a layer of straw, into wooden tubs or long wooden troughs to crystalize, taking care to leave the dregs in the pan. The second boiling should be conducted with distilled water, in the same way as the saltpetre is purified at the Gunpowder Mills. A large copper still and condenser



Copper Still and Condenser.

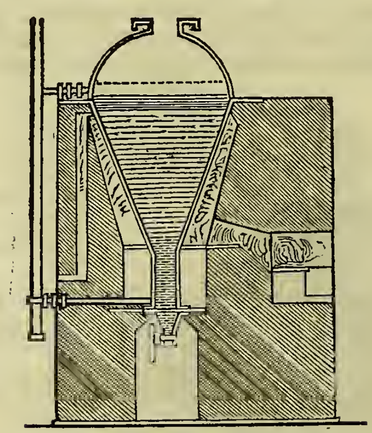
would require to be erected, and a succession of boilers and crystallizing tubs, or, what would be better, a series of large stone ware evaporating pans arranged in long sheds, with a flue for heated air from the furnace of the copper still, passing under each pan, and terminating in a chimney.—Thus (See illustration.)



Stone ware evaporating pans.

The common native Pottery of the country would not answer for evaporating pans, as it is corroded by alkaline salts.

4. The best means for protecting and preserving the salt raised, would be in store rooms built of brick and chunam, with the floor raised a few feet above the ground and paved with dense well fired bricks. An earthen floor contaminates the salts, and there is much loss from this cause. The best way of separating the salts from each other is by repeated crystalizations, or in an evaporating pan of the following description, which allows impurities to fall and the more readily crystalizable salts to be drawn off. See illustration.



Copper evaporating pan for separating salts.

EARTHY MINERALS.

The most abundant of this class is the Limestones, Marbles, Dolomites and Kunkurs, which will be noticed under the class of Building Materials.

Sulphate of Lime or Gypsum is contributed from a good many Districts. The best qualities are from Ootatoor near Trichinopoly, the Chingleput District, Sadras, Ennore, the Red Hills, Nellore, Masulipatam and Bangalore. The only new localities for this mineral are Sadras, the Red Hills, and Nellore. It is now known to occur very abundantly in this Presidency in two forms, the Fibrous and Crystalline Gypsums both free from Carbonate of Lime, and well suited for the Manufacture of Plaster of Paris, for moulds, busts, statues or ornaments. It occurs chiefly in the green sand or lower cretaceous formations, and is almost invariably accompanied by Fossils. The Fibrous Gypsum of Bangalore, Tiagur and Nellore, are the thickest and best. It is not yet known in what strata these occur, as the accompanying Fossils have not yet been traced and the natives seem averse to show the localities for this mineral, in those districts though rewards of 20 Rupees have been offered for this information.

Sulphate of Baryta or heavy Spar of very fine quality is exhibited from several Districts; the best samples are from Kurnool, Sidhout, Cumbum, and Nellore. Yellowish qualities are exhibited from Ootatoor and Masulipatam; the former amongst Gypsum formations and Fossils, the latter interspersed with Gypsum. The chief uses of this substance are for making Stoneware, Porcelain, and Chemical wares, and as a flux for smelting Iron Ores. Hitherto it does not appear to have been put to any use in India.

Satin Spar, or fibrous Carbonate of Lime of very good quality is exhibited from the Hyderabad territories; it was mistaken for Fibrous Gypsum, and on being tested was found to be associated with that substance and with a rarer mineral, Arragonite, which contains the sulphate of strontian, much used in Europe for giving a red color to fire-works. The Satinspar is chiefly used for large ornamental beads and brooches.

Cube spar or Crystalline Carbonate of Lime, of good quality, is exhibited from Nellore, Kurnool and Cuddapah. It is used in thin plates for mounting Microscopic objects and as a source of very pure Lime.

Rhomb spar or Dolomite spar is also exhibited from Cuddapah.

GEMS.

The display of Gems and precious stones is very meagre, and, as usual, the samples contributed are very small and worthless; the valuable or large pieces having been all picked out. There is enough, however, to prove that this Presidency, produces stones of this class, and that, if carefully sought for, good specimens may be found. Diamond conglomerates, sandstones, and earths are contributed from Cuddapah, Kurnool and Hyderabad; and it is known that good diamonds are found in these and other Districts, but none have been sent on this occasion. A model in Lead of a very large diamond is exhibited from Hyderabad, this measures $2\frac{1}{8}$ inches in length by $1\frac{3}{8}$ inches in breadth and $\frac{7}{8}$ths of an inch in thickness, in the rough state. The Gem was found in the mud wall of a native house and was purchased for His Highness the Nizam; a small portion of the Gem had been broken off one end before it was offered for sale.

A rough ruby of nearly two inches in length is exhibited by Mr. Lecot, amongst the precious stones. It contains some specks of Gold, but is of inferior quality and full of flaws.

Some small fragments of Sapphire and of Spinel, the matrix in which it occurs, are exhibited from Masulipatam.

Several Emeralds and other precious stones, as Ruby, Sapphire, Diamond and Turquoise, are exhibited in a cut state in another Class, but these appear to be imported stones.

A number of imitation Gems made from English Crystal and Flint glass variously colored are exhibited from Hyderabad.

Garnets, Carbuncles and Ruby Garnets of very good quality, are exhibited from Nellore, Masulipatam and Bazewarah; but they are not nearly so large, as the Garnets from Mysore and Cuddoor shown at the Exhibition of 1855.

A good specimen of Aquamarine, or Beryl, is contributed by Lieut. Puckle from Mysore: other samples of long reed like crystals are forwarded by the Nellore Local Committee; small pieces of Amethyst, Tourmaline, Rock crystal, Agate and Cornelian are exhibited from Masulipatam.

Schorl in large crystals is exhibited from Bangalore, Nellore and Vizianagrum.

MINERAL SUBSTANCES USEFUL IN MANUFACTURES.

One of the most important contributions in Class I, is the large and complete series of grinding, sharpening and polishing materials, exhibited by Surgeon E. G. Balfour, from the Museum. These were carefully examined by the Jury, along with a voluminous printed Report prepared for distribution amongst the Ordnance, Commissariat and Engineer Officers. The Jury are of opinion that very many of the substances are of excellent quality, that several of them might be judiciously introduced as substitutes for similar articles now procured from Europe, and that India is so well supplied with Minerals of this Class, that a large and remunerative trade in some of them might be carried on, if steps were taken to give publicity to the valuable mass of information collected, and means adopted for distributing and bringing to notice some of the articles for which high prices are given in Europe.

The most striking features in this collection are the abundance of the materials, their general diffusion throughout the Presidency and the infinite varieties of their quality.

It will be necessary to consider them for the sake of order and brevity under the heads of Sandstones, Hones, and Polishing substances.

SANDSTONES.

These occur of different qualities, from the coarsest soft grit, to the hardest Freestone, the most compact snakestone, and the toughest Chert. The sandstones appear to be the most universally diffused rocks in Southern India; occurring in sixteen different Districts, and often in beds or strata of enormous extent, as in the South Arcot, Nellore, Cuddapah, Bellary, Mysore and Nagpore Districts. The Native carpenters, blacksmiths and shoemakers have long been acquainted with the good qualities of the Grindstones of Southern India, and they are accustomed to give good prices for some of them. European workmen are also in the habit of using country stones for sharpening their tools.

The best coarse Grindstones are those from Verdachellum in South Arcot, Triputty, and Ootramaloor in Chingleput, Kurse Mungalum near Vellore, Woontimetta and Chellamacoor in the Cuddapah District, and Podelay and Woodiagherry in Nellore.

A soft sandstone suited for Filters occurs at Rajahmundry, and hard gritty kinds, like the Bhurrstone of France in the Peddaredapully Talook of Nellore and near Ghooty. Some of the sandstones of the Guntoor, Bellary, Madura and Mysore Districts are very similar to those used as Grindstones and Flour Mill-stones in England. The best dry Whetstones are those of Nuggur, Matoor Hill in Guntoor, Triputty, Arnee and Needacherla in Bellary.

Fine grained sandstones of a sharp cutting quality occur at Gootemokoda and Dyda in Guntoor, at Chellumacoor and Chettywarreepully in Cuddapah and in the Podelay Talook and Woodiagherry Hill in Nellore.

A stone resembling the Ayrstone, or Snakestone, occurs at Koopookonda, 8 miles west of Vinacondah in Guntoor.

Good substitutes for Turkey stone, occur at Cuddapah, Woontimetta, Chellumacoor and Humpsagur; and varieties of Green and Grey granular Felspar, at Seringapatam, Nellore, and on the banks of the Godavery. The latter are well suited for putting a fine edge on razors and gravers.

Soft sandstones resembling Bathstone and Tripoli abound near Nellore, Bellary, Cuddapah and Hurryhur.

Very fine silicious and Magnesian Earths, such as Rottenstone, Alkaline Loam and Armenian Bole, occur near Soondoor, Bangalore and Cuddapah.

Hones, silicious and slaty Limestones of every quality, accompany the extensive Beds of Lithographic Marble near Kurnool, Guntoor, Bellary, Datchapilly and Gooty.

Chert or Hornstone suited for paving Flint and Porcelain Mills, occurs in large quantities at Baulapilly near Arcot, Naggery and Woodiagherry Hill in Nellore.

CORUNDUM AND EMERY.

These Minerals which are considered valuable on account of their hardness, which approaches that of the diamond, appear to be very abundant in the Madras Presidency. There are samples of Corundum in this collection from about 28 different localities. The best qualities are the moderate sized picked Crystals from Guntoor, Hyderabad, Coimbatore, Nuggur, and Salem. Some varieties, particularly the tabular shaped Crystals, appear to be much associated with Lime and Fibrolite, and are frequently accompanied in those localities by more valuable Minerals, as the ruby, sapphire, spinel, beryl and garnet. Emery frequently accompanies the Corundum, the best samples are from Salem, Nuggur and Nellore. A fine specimen of tabular Emery has lately been discovered at Caligherry Hill, Nellore.

The following Epitome of the list of sandstones grinding and polishing substances procurable in the Madras Presidency, will give some idea of the extent and value of the collection; the best marked samples alone having been noticed, whilst the others are omitted, because the information regarding them is too vague from the small size or indeterminate quality of the specimens.

As there is much valuable information in the reports, and Surgeon Balfour has taken the trouble of collecting the most useful practical papers, bearing on the same subject, the Jury recommend a first Class Medal for this series.

EPITOME

Of list of Grinding, Sharpening and Polishing Materials used by Blacksmiths, Silversmiths, Jewellers, Stone cutters, Marble and stone Masons.

Europe Grindstones used in the Arsenal, Madras,......	Reddish hair brown, with dark spots, coarse and fine brownish grey, coarse and fine Do. with metallic streaks.
Mr. Law, Sculptor.	Sandstone tinged red, used for cutting marble.
Mr. Ostheider, do.	Brown fine grained do. used for cutting marble.
Mr. Cranston, Shoemaker,...	Purplish, hard, Silicious, do. used as a dry whetstone.
Arsenal and Medical Stores...	Bluish grey ragstone containing lime, used dry by Chucklers and for sharpening laboratory knives.
Marble Polishers...	Ayrstone grit, snake grit.
Stone Cutters	Ennore grit, a nodular, bluish gritty limestone from the bed of the Pulicat Marine Lagoon.
Arsenal...............	Black Turkey oilstones, containing much lime, fine grained Do. from Tarputtry.
Barber's Stone,.....	Black limestone used for sharpening razors.

Sharpening stones used by native saddlers, shoemakers, Horse-shoers, cutlers &c.

Basalt,... ...	Called Sanakul from Chelput, five days journey from Madras near Trinamullay, used by shoemakers.
Basalt,... ...	From near Streepermatoor, used by saddlers for sharpening awls and knives.
Hornblende Rock...	(Greenstone) used by Horse-shoers as a whet for sharpening the large Hoof Cutter.
Green Quartzose sandstone.........	From Vellore, used formerly by Horse-shoers but now replaced by sills of Corundum and Lac.
Red Quartzose standstone.........	Do. Do.
Yellow Quartzose sandstone...	From Woodiagherry used formerly for giving a first edge to swords, daggers and implements, hard, rough and well suited for grindstones.
Red fine grained sandstone.........	Very good.
Reddish-yellow and white Quartz......	Formerly used by Horse-shoers.
Rolled Fragments of Binary granite.	Red and yellow, used by shoemakers.
Fine grained Red Quartzose sandstone.	Formerly used by Horse-shoers.
Fine grained nodule of reddish Quartzose................	Used by saddlers, who say they do not know its origin.
Porphyritic grey granite	Used by shoe-makers.
Hones.................	Purchased in the Bazaar, probably from Nellore, Cuddapah or Guntoor.
English Grit.........	Fine grained, used by stone Masons.
Rolled masses of Granites....	Sold in the Bazaars as Corundum and Emery.
Irregularly crystallized granites....	Sent by the Commissary General as Emery: said to be procurable at Calastry, near Naggery, Naglapoorum and the surrounding Hills.
Steel Filings.........	Used by stone cutters for the first process of rubbing down.
Pumice of Europe.	
Sand paper.	
Crocus, Country....	A red Carbonate of Iron.
Washed Emery.	
Crocus.	
Putty Powder or Oxide of Tin.	
Rotten stone.	
Tripoli.	

Rouge or Red per-carbonate of Iron, imported for polishing Jewellery.

Materials from the provinces of the Madras Presidency suited for grinding, polishing and sharpening.

GRINDSTONES.

North Arcot.........	From Kurse Mungalum near Vellore, a stone called Muddy Sagapoo Culloo, Brown Steatitic sandstone.
	from Baulapilly near Arcot, Grey Chert for paving Porcelain Mills.
	from Chumbaukum-droog, Quartzose Rock suited for paving Porcelain Mills.

North Arcot contd...	from Trichoor brownish sandstone.
	from Muddoor, Arnee, Bluish grey sandstone suited for Grindstones.
	from Triputty and Kurkumbady, Yellow red and purplish sandstones.
South Arcot.........	from Verdachellum and Sadras, sandstones of good quality.
Bellary..............	from Nedacherla, sharp grained and fine grained sandstone.
	from river near Bellary, silicious sandstones.
	from Hospet Chetty-warrepully and Humpsagur, Hones of various qualities.
Chingleput..........	Cootharam pallum near Conjeveram, Coarse Grit. from Ootramaloor, Red Grit.

Sandstones suited for Grinding purposes.

Cuddapah...........	From Chellamacoor, Greyish brown schistose granular standstone.
	from near Cuddapah, Bluish grey compact Magnesian lime, suited for fine sharpening stones, from Woontimitta fine grained schistose. Sandstone, suited for a Ragstone.
Ganjam........... ...	from Chitterpoor and Nengaum, liver brown granular sandstones. These are very sharp in the grain.
	from Ganjam, Reddish white granular sandstones.
Guntoor...............	from Palnaud, purple and lilac slaty sandstones fine in grain. Honestones, black limestones, lithographic marbles.
	from Gootemookoola and Dyda, Hones from Koopookoonda 8 miles west of Vinacondah, below the signal pond, Rough sandstone glistening with Mica.
	from Matoor Hill, schistose ragstone.
Hyderabad...........	from Ellichpoor and Kotah, sand stones with Fossils.
Kurnool...	Sandstones Hones and Lithographic marble, abundant, and of every quality and size.
Madura...............	from Vurdeputty and Passumallee, Granitic, coarse grained grindstones.
Moulmein............	from Tan-goon-gee, Thum-litandan (Mountain), Gungo and Amherst Hills, yellowish sandstones fit for Grindstones.
Mysore...........	from Nuggur good Grindstones called Sanekull and finer Whetstones.
Nagpore..............	from 10 miles west of Kamptee, soft standstones suited for dry whetstones.
	from 6 miles east of Kamptee, finer grained varieties.
Nellore...	from the Podelay, Panoor and Pedda Redda-pully Talooks, red, yellow, purple, brown and grey sandstones.
	from Pullaybootoo, fine grained standstones.
Rajahmundry........	Soft sandstones suited for filters and Grindstones.
Singapore......	from the mouth of the river, a good sandstone.

CORUNDUM

is found at Guntoor, Hyderabad, Salem, Mysore, Gram (45 Miles N. W. of Seringapatam) Nuggur, French Rocks, Burkunemilly and Yedkunkal, Kulkaire in the Division of Churajapatam, Norluk in Narsipoor, Deysam, Carbunpully, Appianhully, Nullapardy, Mundium in Astragam, Cuddor; in Salem at Namaul, Viralamoodoo, Cholasigammy, Carasel, Aupore, Mallapollye, Gopaul Chetty pollium, Teelanegerry, Coundapaddy and with Rubies at Salem.

Naggery Hills, clove brown with iron Garnets and Cochineal red Garnets, Yala-negery and Coundepaddy in Salem. It is also found at Travancore, of a green color, and accompanied by Aqua marine.

Amongst the Minerals useful in Manufactures are Clays, Kaolins and Porcelain Materials which will be noticed in Class XXV, along with the articles manufactured from them.

ALEX. HUNTER, M. D.

REWARD OF 50 RUPEES,

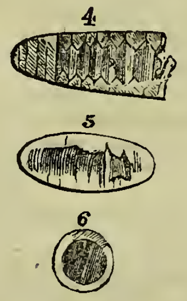
FOR BLUE MOUNTAIN LIMESTONE.

CIRCULAR No. 1.

Mountain Limestone, containing black carbonaceous matter, fossil shells and corals has been found in considerable quantity and in very large blocks in and about Madras; the old grindstones at the Bakery are of one kind, the large mill stones formerly used in the St. Thome Tannery are of another, and several mill stones at Chintandrapett and Royapooram are of the same Limestone. The native stone cutters are acquainted with it, and say that it occurs at Trittenny, Muddoor, and Attipacherry near Naggery; the tombstones at Sadras, 200 years old, are also said to be of the same stone. Steps have been taken to verify this statement. One variety is of a brownish grey color and contains numerous fragments of fossil coral. The other which is more abundant, is of a dark grey color with patches of black here and there, and numerous fossil shells, and pieces of coral throughout its substance; when broken, the stone emits a strong unpleasant, sulphureous smell. It is a compact rather hard stone, that rings when struck with iron: the broken surface is uneven and has a shining grey appearance with whitish spots here and there; when rubbed smooth with sand and water, these spots are found to be composed of fossil shells of which the most distinct are here represented.

1 Leptaena.

2, 3 Spirifers.



4, 5, 6 Fragments of Coral —apparently Encinites.

No. 7.

No. 7 is a piece of the limestone rubbed smooth showing a Spirifer and portions of Encrinites. The limestone is of considerable interest as it usually accompanies beds of coal, dark colored sandstones and conglomerates lying upon it, while it rests upon granite. The strata at the borders of coal formations usually have a slight inclination or dip, and the granite, mountain limestone and dark sandstone frequently crop out of the ground. Above the coal, pale grey, yellow and pink sandstones occur, often

in beds of great thickness accompanied by whitish clay, lime, ironstone in balls or seams and soft slaty shales of white or greenish colors. All these strata have been found occurring together in the Chingleput District. A stone resembling the old red sandstone occurs at the Red Hills and extensive beds of pale colored sandstones in great abundance along the base of the Naggery Hills, towards Arnee in one direction and by Tripasore towards Curcumbaddy in another; the same kinds of stone resembling the new red sandstone pass through the Chingleput District to the south, reappearing at several places between Ootramaloor and Verdachellum where they acquire considerable thickness. Fossil trees, impressions of Zamias a variety of Tree fern and other interesting organic remains have lately been found in the same tract of country. Pale coloured sandstones also appear in large and extensive beds in the Nellore District; in some localities they are of a white color like the Freestone on the borders of the coal formations in England and Scotland. The mountain limestone probably occurs in the vicinity of some of these beds of sandstone. A reward of **50** Rupees will be given to any one who will produce a bandy load of the stone in fragments and will show where it is quarried. Samples of the stone have been largely distributed through the Chingleput, Nellore, and South Arcot Districts and others may be had on application at the School of Arts. A. H.

REWARD OF 50 RUPEES.

FOR BLUE MOUNTAIN LIMESTONE.

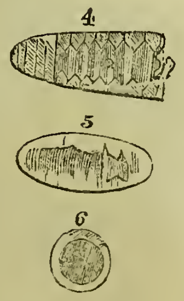
CIRCULAR No. 2.

In December last or about two months ago an illustrated Circular was issued offering a reward of 50 Rupees to any person who could tell where the large grindstones (composed of Fossil Mountain Limestone), that had been in use at the old Bakery in Madras or the Tannery at St. Thomé, had been quarried; the conditions being that a bandy load of the stone in fragments should be produced and the locality shown. Pieces of the limestone were freely distributed with the Circular and we have to return our best thanks to 43 different persons who have kindly forwarded samples of stones in reply. The object of issuing these illustrated Circulars is to try to attract attention to the Fossil remains of India with the view of determining the relative ages of the strata producing them and to obtain if possible some indications of Coal. The Limestone in question is full of Fossils bordering upon, but below the Coal series—the accompanying illustrations represent a few of the best marked Fossils which have been engraved from the polished pieces of Limestone now arranged in the Madras Exhibition along with the various stones received in reply to the Circular.

The first 7 illustrations have already appeared.

1 Leptaena.

2, 3 Spirifers.



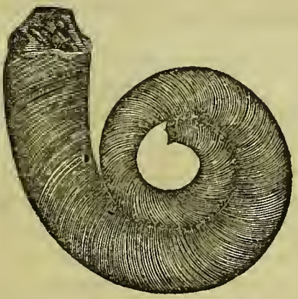
4, 5, 6 Fragments of Coral —apparently Encrinites.

No. 7.—Piece of Limestone polished showing side view of a Spirifer and portions of Encrinites.

Within the last month one of the grindstones has been considerably worn down, and a few more Fossils have become apparent, the best marked of these are:—

No. 8.—Cyathophyllum Caespitosum, a Fossil coral of an extinct genus.

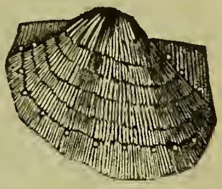
No. 9.—Portions of a Cyathocrinites, or Hypanthocrinites.



No. 10.—A Fossil bearing some resemblance to the Lituites Cornu Arietishere figured or to

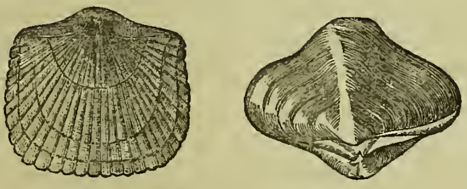
No. 11, Euomphalus pentangulatus.

These species, which all belong to the Carboniferous or Mountain Limestone, have been detected on one of the Millstones which is of a brownish yellow color and which has evidently been quarried at some other locality than the rest, as the stone is softer, of a different color, and does not emit a sulphureous smell like the others when rubbed. One of the largest grindstones, which is about 6 feet in diameter by 14 inches in thickness and composed of a harder blue mountain limestone with fewer and smaller fossils, has also been carefully polished and examined. It contains numerous fragments of the stems of Encrinites with a few specimens of No. 12. Spirifer glaber, a bivalve shell now extinct, and No. 13—Productus or (Leptaena) also extinct and belonging to the Mountain Limestone series. Along with these are patches of black carbonaceous matter and brown sulphuret of Iron.



No. 12.

Spirifer Glaber.



No. 13.

Productus or Leptaena.

It will not be necessary to particularize all the specimens that have been received, as many of them are not limestone, though they bear a strong outward resemblance to the specimens distributed.

Good limestones have been received from thirteen different localities ; of these the most promising are the following, which are arranged in a tabular form, to show the accompanying indications, with remarks upon their relative importance.

Minerals forwarded.	District.	Name of Contributor.	Accompanying strata.	Remarks.
Black Carbonaceous Limestone conglomerate.	Kondoopalpand near Gooty.	Major Bisset.	Sandstone conglomerates, Pitchstone, Black-band Ironstone and Bitumen.	The Limestone burns white. The Sandstone resembles Old Red Sandstone: the Bitumen is of good quality.
Grey Magnesian Limestone.	Gooty.	Major Bisset.	Contains Iron Pyrites and is accompanied by Sandstone.	This Limestone often accompanies new Red Sandstone and is rich in Sulphurets of Iron, Copper and Lead.
Blue Mountain Limestone.	Cuddapah.	Capt. Hemery.	Sandstones and slates.	Without Fossil remains.
Black Mountain Limestone.	Nundial, Cuddapah.	Rev. E. Porter.	Sandstones and slates rich in Iron Pyrites.	This Limestone burns white. Fossil remains occur in the vicinity.
Grey Slaty Limestone.	Near Cuddapah.	M. Murray, Esq.	Sandstones, slates and Lime.	This is procurable in large slabs at a cheap rate.
Grey Cherty Limestone.	Near Cuddapah.	M. Murray, Esq.	Sandstones, Chert and Jaspery Ironstone with Conglomerates.	Fossile woods and other organic remains accompany this Limestone.
Dark Grey Limestone.	2 miles W. of Vurdoor in S. Arcot.	Arthur Hall Esq.	Conglomerates and Sandstones.	Fossil Bacculites and Gypsum Fossils apparently above new Red Sandstone.
Grey Magnesian Limestone.	Seedrapett, South Arcot.	Arthur Hall, Esq.	Sandstone and gravel with numerous Fossils of the Greensand formation resting on thick beds of Sandstone.	This is a Hydraulic Limestone which appears to extend over a considerable tract of country.
Yellow Magnesian Limestone.	Ootatoor, near Trichinopoly.	E. T. Ricketts, Esq.	Sandstone Gypsum, Sulphate of Baryta, Jaspery clay Ironstone with Fossils of the Greensand formation.	Remains of bones of Gigantic Saurians occur in this locality, and a slaty kind of coal was found in the District by the late T. Boileau, Esq., of the Civil Service.
Grey Fossil Limestone.	Trichinopoly.	Capt. Wilkieson.	Accompanying strata not forwarded.	This appears to be full of Fossil shells of the Cretaceous formations.
Black and grey Chert with impressions apparently fossil.	Naggery Hills, Chingleput.	Cooly Rugven	White, Red and Yellow Sandstones and Conglomerates.	These beds of Sandstone are of some thickness, resembling the new Red Sandstone.
Grey Limestone encrusted by a Fossil.	Red Hills near Madras.	Cooly Bungun	Jaspery Clay Iron stone, balls of Gypsum, Fossil bacculite, Do. Favosite, Coarse Red Sandstone, Pitchstone and Laterite with balls of Chert.	The strata seem to be much disturbed: Sandstones and chert resemble the old Red Sandstone formations. The Fossils and Gypsum are lying in detached pieces.
Fragment of Coal with Pitchstone and Sandstones.	Caligherry, Nellore.	G. Powell, Esq., & Lieut. Mullins.	Conglomerates coarse gritty and fine Sandstones, Fossil-wood, Laterite and Pitchstone.	A piece of similar coal was found in this district in 1851 by the late D. White, Esq.
Black Sandstone.	Oodiagherry, Nellore.	F. Crozier, Esq.	Chert, white and yellow Sandstones with Iron ore and polishing slate or Tripoli.	These Sandstones are of great extent and resemble those from Chingleput and Naggery.

Minerals forwarded.	District.	Name of contributor.	Accompanying strata.	REMARKS.
Grey compact Limestone.	Mysore, Sircy.	Mr. Sylk, aud Col. Green.	Strata not forwarded.	This resembles the limestone that occurs above Coal in England.
Grey compact Limestone.	From Coal Districts near Manchester in England.	Maj. Maitland	Strata not forwarded, probably resembling the next series.	This Limestone is much used in smelting Iron ores and for building.
Fossils shales and Limestones from the Coal formations.	Fifeshire Scotland and Newcastle in England.	Rev. A. Campbell.	Lime, Iron, saudstone and Coal.	Very useful for reference.
Fossils shales, Sandstones, Lime and Iron from Coal formations.	Near Dalkeith and Edinburgh.	Alex. Hunter.	Sandstone Conglomerates, Iron, Lime and grey slate.	Do. do.

In addition to the above, there have been numerous contributions chiefly of greenstone, potstone, grauite and chert, bearing a faint resemblance to the limestone in appearance, but on being tested with acid they did not effervesce. A few of them were forwarded by particular request in order to verify some statements that had been made to Mr. Ostheider by the native stone cutters, who asserted that the limestones were abundant at Muddoor, Tritenny, and Attipacherry. The stones which have been procured from these localities all resemble the limestone, but are hard silicious greenstone or a fine grained augite. A variety of potstone from Naggery bears some resemblance to the stone. It was also asserted that the old carved Tombstones at Sadras and Pulicat were of this limestone and that they were probably all imported from Holland, but Mr. Wall has inspected the Tombstones in Sadras and they are of a hard silicious greenstone This has been further corroborated by Mr. Shubrick, who has forwarded samples of the greenstone from the quarries at Warragadum and Adialcherry, where the Tombstones were cut. The Tombstones at Pulicat have also been examined by Lieutenant Sankey of the Engineers, who reports that they are of a hard silicious greenstone, like the ordinary firestone of Madras, and that there has been a large manufactory of Tombstones in the vicinity, where there are several unfinished stones bearing old dates intended for parties at Masulipatam and other localities.

The most promising results from this enquiry are the grey limestone from the South Arcot District, about 85 miles from Madras. The limestone is hard, compact and full of fossils, but it belongs to a formation more recent than coal, while the mountain limestone distributed is of the carboniferous period with Silurian fossils, and will probably be found resting on old red sandstone amongst decaying granites.

The Black Dolomitic Limestone Conglomerate, with sandstones and Bitumen from Gooty, are also interesting, and the black, grey, and blue limestone from other Districts are important, as furnishing Magnesian limestones rich in metallic sulphurets and possessed more or less of Hydraulic properties. The coal from the Nellore District appears to be a stray surface piece, or it may have been accidentally left there many years ago by some Europeans who worked some of the copper ores under Captain Ouchterlony. The pitchstone with conglomerates, sandstones and fossil-woods from the same locality would indicate that the coal may occur in the vicinity. Several other substances strongly resembling coal have also been forwarded from Nellore, but they occur embedded in primitive formations where coal is not found. Instructions have been sent to Lieutenant Mullins and Mr. Powell to make further search amongst the sandstones, conglomerates and fossil woods and to other parties to look in the direction away from granites and crystalline primitive rocks, where coal does not occur. The reward of **50** Rupees still remains unclaimed and it is strange that no clue can be obtained to the locality where the stones used in the old Bakery at Madras, or the old Tannery at St. Thomé, were quarried and from which the Fossils engraved in this Circular have been collected. Parties desirous of obtaining samples of the above limestone are requested to apply at the Madras School of Industrial Arts. The specimens which have been received in reply to the previous Illustrated Circular may be seen amongst the minerals at the Exhibition. Illustrated instructions are being prepared to guide parties in their search for coal and will be printed shortly.

ALEX. HUNTER.

MADRAS, *27th February* 1857.

Associates.

Honorable Walter Elliott, Esq.
Brooke Cunliff, Esq.
Alex. Hunter, Esq. M. D., *Reporter.*

FOSSILS.

A very large and varied collection of Fossils is contributed from several Districts. This is an interesting and important fact, which proves that Exhibitions may be made subservient to useful purposes, if properly conducted.

In the Exhibition of 1855 there was only one Fossil, viz. an Ammonite embeded in Jaspery Clay Iron stone, from the Gypsum formations at Ootatoor.

A few illustrated Circulars on the subject of Fossils were printed and widely distributed through the Presidency, calling attention to the subject of Fossil remains as the safest guides for determining the relative age of strata. The results of these enquiries have proved most encouraging, 2 Cart loads of Fossils having been received from Ootatoor, and about 3 Cart loads from other places. Steps have been taken to continue these enquiries in a systematic and continuous form. The series of illustrated circulars in the Appendix of the Jury reports have been printed with the view of illustrating some of the most interesting Fossils in the Exhibition, and communicating the information that is best suited to guide enquirers in their search for Fossil remains. The largest series of Fossils in the Exhibition is contributed by F. Ricketts Esq., Executive Officer Dept. Public Works Ootatoor. This collection contains Gigantic Ammonites, Nautilites, Belemnites, Bacculites and several other chambered and bivalve shells from the Greensand or Musselchalk formations, one of the lowest of the Cretaceous group. The accompanying Strata being Fibrous Gypsum and Selenite, Fibrous Sulphate of Baryta, Yellow sandstone slightly Magnesian and Hydraulic, with Jaspery and Ochery Clay Iron stones. The bed of Gypsum was discovered 7 or 8 years ago by Major Lawford and has been used in large quantities in Madras for making Plaster of Paris moulds. The locality has been frequently visited lately by Mr. Ricketts and others, who report the great profusion of Organic remains in the vicinity, particularly of rounded and oval balls of different sizes from 8 or 10 inches in diameter down to one or two. On examination these prove to be coprolities or Fossil dung of huge reptiles, and they are accompanied by bones of a large size. The locality was visited some months ago by Mr. Adolphe Schlagintweit of the Government Magnetic Survey, who discovered a piece of the Femur, (a Condyle apparently,) of a huge saurian reptile, since then two large teeth have been met with at Ootatoor, bearing a strong resemblance to those of the Megalosaurus figured in the XXIII Vol. of the Geological Society's transactions, and a portion of bone from the same locality appears to be the Angle of the left lower jaw of some large Saurian (some doubts are entertained about the teeth). See illustrations.

The most abundant of the Fossils seem to be Ammonites, Nautilites, Belemnites and a large species of Mytilus or Mussel. For further particulars see Catalogue Raisonné of Class I, prepared by Lieutenant Hawkes. Another large series of Fossils of the same period of formation is contributed by Arthur Hall Esq. from Vurdoor, Seedrapett and Trivacarey, in the vicinity of Cuddalore. In this collection the Ammonites are plentiful, and a few Nautilites occur; but the Belemnites and Mytilus are absent, Bacculites are very abundant and are found embedded on the surface of a compact blue Limestone; a very large species of Arca and a number of spiral and bivalve shells; Echini and Nucleolites are also plentiful at Seedrapett. The accompanying Minerals are soft yellow Sandstone, Red Marl, and grey Limestone, with here and there crystals of Gypsum. Among the Fossils are Spatangus, a species of Crab and the Molar tooth of an Elephant, with large blocks of silicified Fossil wood from Trivacarey. For further particulars, see list.

An interesting enquiry was set on foot upwards of two years ago, with the view of ascertaining the localities where two kinds of Mountain Limestone that seem to be plentiful in Madras were quarried. There are a number of grindstones in use in Madras and its vicinity that vary in size from 2½ to 5½ feet. On close examination they are found to be composed some of Blue and others of brownish grey Monntain Limestone, containing numerous Silurian Fossils. The following illustrated circulars were printed and widely distributed offering a reward of Rs. 50 to any one who could tell the locality where they were quarried. Several interesting Limestones were received in reply, and Minerals were forwarded by forty six different parties, but as yet the locality of the particular Limestones required, has not been traced. The best Limestones are a grey Limestone from Vurdoor in the South Arcot District with Fossil Bacculites. A Crystalline grey Limestone from the Red Hills with a portion of a large Ammonite and a Favosite and Bacculite found in the vicinity and a grey Limestone from Sircy without Fossils, contributed by Col. Green, several other (7 or 8) grey and black Limestones have been contributed from different districts, the most interesting of these are dark, Magnesian Limestones, Dolomites, Dolomitic Conglomerates and black Marbles from Cuddapah, Kondoopalpaud near Gooty, Nundial, Dhone near Kurnool and Goodepaud, Nerdicherla, Booragul, and Tarputree in the Bellary District. These appear to belong to the same large deposit of Magnesian Limestones that traverse the Ceded Districts, and the valley of the Kistna, from Kaladgee to the Guntoor and Masulipatam Districts. In

some places they are reported to be accompanied by Fossils, and in almost all by Sandstones, shales and conglomerates.

Fossilwoods, black chert, and fossiliferous looking nodules have been sent with black and grey magnesian Limestones from the Cuddapah District, and shells are reported to have been found with the Dolomitie conglomerates near Ghooty, but none have been sent to Madras. Some recent concretionary Limes encrusting leaves and roots were forwarded by Major Bissett from Kondoopalpaud, along with Stallactites, Stalagmites, and Bitumen. The black Marbles and dark Dolomites from the Ceded Districts were all tested and found to contain more or less Magnesia, and on being calcined, they all burned to a pure white, except one from Nundial, containing much Iron Pyrites. This shows that the coloring matter of the limestones is Carbonaceous. Some printed Circulars with illustrations of the Fossils of the Magnesian Limestones, new and old red Sandstones, and Carboniferous Strata are nearly ready for distribution in the Districts from which the Dolomites and black conglomerates and Marbles have been received and it has been proposed that Mr. Wall should visit these districts with the view of searching for Coal. (Mr. Wall has been ordered by Government to proceed to Kurnool to examine the Argentiferous lead ores of the District.) Some interest has been excited by the distribution of illustrated circulars throughout the country and search is still being made for Mountain Limestone. Capt. Wilkieson of the Engineers reports that a Tomb stone to the memory of Hildebrand Gordon Oakes, Esq., of the Bombay Civil Service who died at Ootacamund in 1831 is carved in Mountain Limetone full of fossils exactly like those in the printed-Circular distributed, but whence it was obtained has not been ascertained.

Lieut. J. R. Magrath, Artillery, contributes some interesting fossils from Prome. These belong to tertiary formations and are accompanied by the following strata; coarse and fine yellow sandstones, fibrous Limestone, Magnesian clay and Jaspery Clay Ironstone. The fossils consist of silicified wood, both endogenous and exogenous, a few small portions of bone and black bituminous wood, with the following shells embedded in a mixture of hardened Lime, Clay and Sand. Ostrea, Venus, Turritella, Cardium, Pleurotomaria, Murex, Vermetus, Turbinolia, Brissus, Pecten, Conus, Cardium, Arca, Cardita and Trochus nearly allied to some existing species.

The Honorable Walter Elliot contributes a sample of compact grey limestone from the caves opposite Moulmein. A few shells can be detected in the Limestone a section of a Natica and of a bivalve are apparent. A number of Fossiliferous substances of recent origin are contributed from various quarters; among these are the enamelled scales of some fish found on the parade ground at Trichinopoly by Capt. Russell. These vary in size from half an inch to an inch and a half, they are composed of two plates meeting at an angle like a V the outer surface is covered with enamelled white tubercles. The inner surfaces are cancellated like bone. Doubtless these are the bony plates of silurides or cat fish, many species of which abound in the Cauvery and all fresh waters of Southern India. Mrs. Crisp exhibits some petrified reed like grass collected by Sir Stamford Raffles in Sumatra. The School of Arts exhibits some petrified hay, straw, and roots with Fossil Ostrea, Cardium, and other shells belonging to the recent Tertiary formations, contributed by Mr. Frere from Nuggur Parkur in Scinde. There are a number of septaria and balls of lime of different forms from various districts. Capt. Puckle exhibits three varieties from Bangalore, two resembling the Fossil dung of Animals and the third a hollow ball of dark blue Hydraulic Lime, along with these is also forwarded what appears to be half of the dorsal vertebra of some large animal. Further search is being made for more organic remains in the neighbourhood of Bangalore. The Revd. A. Campbell exhibits a fine collection of fossils from the Coal Formations in Fife and a few from Burdie House near Edinburgh.

The School of Arts exhibits fossils from the Coal formations at Newcastle and near Dalkeith, with the accompanying strata, also the strata accompanying Coal from Burdwan, the bituminous wood and Gypsum Fossils of Perambore and a large series of Gypsum fossils of apparently recent origin found from Madras to Ennore.

Mr. Lawford exhibits similar Gypsum fossils with bituminous wood and alluvial Pumice from Sadras.

The Madras School of Arts exhibits a large series of Gypsum formations from 23 different localities; also a few fossils with balls of Crystalline Gypsum, dark red sandstones, and greyish Lime from the Red Hills: amongst these are a Bacculite and a Favosite in Jaspery Clay Ironstone.

ALEX. HUNTER, M. D.
Reporter.

RESULTS OF THE EXAMINATION OF SPECIMENS OF GALENA FROM THE MADRAS EXHIBITION.

No. 1. Said to be from Martaban.

This was a small hand specimen, and the amount of silver it contained was found to vary in different portions of it, the per centage of lead being about 75. In the first trial the silver was found to amount to about 70 ounces to the ton of ore; but in the second to not less than 300 ounces in the ton, or a little less than 1 per cent.

No. 2. Said to be from Kurnool.

The examination of the first specimen of this ore proved it to contain upwards of 1 per cent of silver, or 374 ounces in the ton, the quantity of lead and silver together being only 45 per cent which was occasioned by there being a considerable quantity of gangue disseminated through the portion examined.

Another specimen, which was given to me by Colonel Cotton and also said to be from Kurnool, was found to contain 175 oz. 3 dwts. in the ton.

Some years ago I examined a specimen of the Kurnool Galena and found it to be free of silver; and I have been consequently, until the present time, under the impression that it contained none. But the examination of the specimens in this year's Exhibition reveals the fact that at least some portions are very rich in the precious metal and this accords with the recent researches of Malagah and Durochet who have found that when Sulphide of Silver is associated with the Sulphides of other metals, it is *always* unequally distributed. It would appear therefore from the above facts that it would be quite impossible to calculate, with any approach to accuracy, from the examination of any given specimen, what would be the average yield of silver in a silver lead mine, until it is actually worked for the separation of that metal, considering however that nearly one half of the silver now in circulation in Great Britain is recovered from silver lead ores similar to the above, and seeing that it is found to be advantageous to separate the precious metal where it exists to the extent of only 6 ounces in the ton, it becomes evident that these ores must be of great value, provided they can be found in sufficient quantity. From recent information obtained from Kurnool it would appear that the Galena there occurs abundantly in all probability; therefore it would prove to be highly remunerative to work this mine, both for the lead and silver contained in the ores.

ILLUSTRATED CIRCULARS DISTRIBUTED.

PRACTICAL GEOLOGY.

No. I.

GRANITES AND PRIMITIVE ROCKS.

The oldest rocks on the surface of the globe are granites and the substances of which they are composed, viz., Felspar, Quartz, Mica, and Hornblende. These are all classed as primitive or plutonian rocks, and they bear distinct evidence of having been formed in the interior of the earth from which they have been upheaved at different periods. Until 50 years ago it was considered that granites and primitive rocks were all about the same age and that they were invariably the oldest rocks to be met with, but further researches have proved that in the same range of hills granites of very different qualities and of two or three distinct periods can be detected bursting through each other.

If we compare the earliest records we possess of the creation, viz., those so simply and sublimely detailed in the first chapter of our Bible, with the actual facts as they may be observed in almost any district of Southern India, we find a beautiful harmony and consistency pervading the whole system of creation, and the elements of our globe are arranged according to such laws, that a description of the minerals and the various succession of strata as they occur in one region, will serve with very trifling alterations as a guide for the study of Geology in any part of the world. A few trifling differences do occur amongst the minerals, as for instance one being replaced by another, but the characters of these will be found similar though the elements differ. In the succession of strata too, the order is the same, though there may be apparent gaps or omissions, yet the consistent uniformity which is found pervading the works of creation is so beautiful and so apparent when closely investigated, that all can be proved to be order and symmetry which appears to the casual observer to be confusion and accident.

We cannot prove incontestibly where, or amongst what formations, the earth had a beginning, but we can detect the relative ages at which mountain chains were upheaved, and when organic beings were first formed. We can show the transmutations of the older large crystalline into the finer crystalline and then into the metamorphic or granular, sandy and slaty rocks; with the numerous subsequent changes of which the proofs are more palpably apparent. It can easily be proved that the earth's surface has been remodelled again and again, that mountain chains have been raised or sunk, burst through and overturned in various ways, valleys filled up and then re-excavated; that sea and land have encroached upon each other and frequently changed places, yet through all these revolutions, records are left of a creative Power that ordered and arranged the succession of strata in such a manner as to fit the earth and the seas for sustaining particular forms of animal and vegetable life, and proofs may be found in almost every region of the globe that various successions of strata have occurred, each bearing an impression of the Creator's wisdom, either in the regular arrangement of the constituent elements, or in the vestiges of some animated existence which, though different from the forms now to be met with, bear sufficient resemblance in some characters, to admit of their being referred to their proper place in the scale of creation.

In the first period of the earth's formation the surface of the ground seems to have been level or nearly so, and this can be better proved in India than in most other countries, for we have immense tracts of bare uncultivated land, the component parts of which can be easily examined in water courses, nullahs, or in sinking wells. This level country differs very materially in its characters according to its position; thus, on extensive plains at a distance from hills it is sandy, earthy, or covered with rich soil or loam, but none of these are the old or primitive formations. The first elements of the globe appear to have been Felspar, Quartz, Mica and Hornblende (with small quantities of Lime and other substances). These are the constituents of granite and of primitive rocks, but in many parts of the world we find them on the low or undulating country at or near the

base of granite hills.* The same primitive or elementary rocks will be found running through the whole granite range and through several succeeding strata, but assuming different forms and usually becoming finer or smaller in grain till, on arriving at the secondary and tertiary formations, we find their particles so minute that they can only be detected by the agency of a magnifying glass, or so much altered in composition that the aid of Chemistry is requisite to determine the presence of the same chemical elements.

In the first verse of the first chapter of Genesis it is simply recorded, that "in the beginning God created the heaven and the earth," and in the second "the earth was without form and void and darkness was upon the face of the deep." It is commonly supposed that the mountains are the oldest parts of our globe, but if we examine almost any range carefully, we find the debris of older mountains at their base, and these appear to have been formed on the grandest scale with their constituent parts in the largest masses or crystals, each succeeding upheaval being composed of similar or other rocks of a finer grain and usually in smaller crystals. Now if we examine the level or low undulating country near the foot of granite hills, we find the elementary rocks composing granite, usually in huge masses, but more or less decayed and frequently covered by a thin stratum of soil. The Felspar in beds of 8 to 10 feet in thickness, Quartz in similar masses either hard and clear or in an opaque soft powder, Mica and Hornblende in smaller proportions but decayed and crumbly. This appears to be granite in its earliest form, though we cannot say whether it now occupies the position in which it was created or has been over-thrown from some previous mountain range. Bursting through this we find masses of granite in large or small crystals and more or less decayed on the surface according to the proportions of Felspar or Mica contained in the rock. There is a beautiful provision of nature for causing the decay of granites so as to lead to the formation of soil, clay, loam and sand. The Felspar, which forms nearly two-thirds of granite rocks, contains Potass, an Alkaline substance with a strong attraction for moisture or water. After a shower or a heavy night's dew, the moisture is taken up by the Felspar and conveyed into the substance of the rock, a portion of the potass being dissolved out. After a time the remaining constituents of the Felspar, viz., the Silica and Alumina become crumbly and gradually fall into powder, called Kaolin or porcelain earth, or are washed into clay and soil. Quartz, which is the hardest part of granite, is also the least liable to change, it forms about one third of the whole constituents, and is the source from which much of the sand on the surface of the globe is derived. Mica the soft shining scaly part of granite is very liable to decay from constant damp ; it passes into a greasy or soapy earth or loam.

As it may interest our readers to know the localities where some of the facts here detailed can be observed, we may mention that the elements of granite on a gigantic scale but in a state of decay occur on the banks of the Adyar river, near the Marmalong bridge, on the plains to the N. W. of Palaveram, at the base of the hills near Arcot, in most of the nullahs about Bangalore, and at the base of the hills in the Chingleput and Salem Districts. Bursting through these old granites we find the hard, durable, and equally crystalline varieties which form most of the present mountain ranges in Southern India ; by reference to the accompanying table, the names, constituents and general characters of these granites will be seen at a glance. It is not possible to determine accurately their age, as the class of rocks we are now considering do not contain any remains of organised substances, and they appear to have been upheaved previous to the creation of vegetables or animals ; all we can say is that those granites or rocks which have burst through others, are more recent than the rocks which have been burst through. The last kinds of granite which appear to have been formed are very small and almost granular in their composition, bordering upon the metamorphic and transition rocks which will next be described. Attempts have been made to divide granites and plutonian rocks into primitive, secondary and tertiary, in the same way as succeeding strata, but we have not sufficiently precise data for this arrangement.

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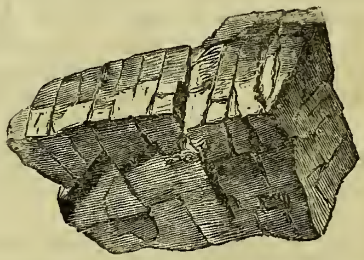
* With the view of simplifying the study of Geology, we propose keeping the descriptions of the characters, chemical composition, geological position and general remarks upon rocks and minerals with their illustrations, separate and arranged in a tabular form for the convenience of reference.

The minerals which enter into the composition of granites are——

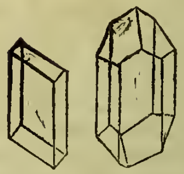
FELSPAR, QUARTZ, MICA AND HORNBLENDE.

Felspar presents the following characters, it is rarely found in crystals, but usually in irregular masses that break into oblique four-sided prisms, usually dull on the ends but with a glistening appearance on one or both opposite sides, the fractures are straight and parallel, one of them oblique, the surfaces glisten more on the broad flat planes than on the sides. The form of the crystals is usually oblique, four-sided prisms, or rhombs bevelled at the extremities. It occurs of all colors, is softer than quartz, can be marked with steel, but scratches glass; it is frangible, rather heavy. Specific gravity 2.567. It melts into a semi-transparent enamel under a strong blast heat. This is the basis of porcelain and of fine glazes for table wares.



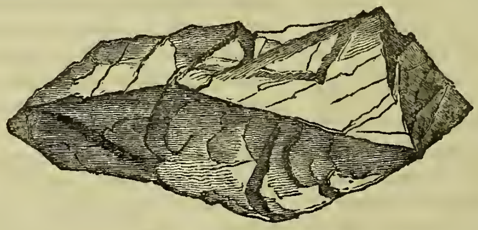
Felspar.

Constituent parts.	
Silica,	66
Alumina,	17
Lime,	1
Potass,	13
Oxide of Iron,	1
Water,	2

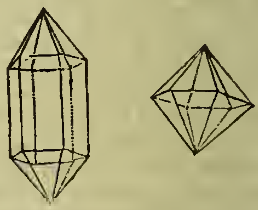


Crystals of Felspar.

Quartz occurs both massive and in crystals of all sizes and of a great variety of colors. It breaks into tabular, cubical, pyramidal, and conical masses; usually shining or glistening on the surface; the fracture is conchoidal in one direction, coarse and splintery in the others; occasionally it has a parallel fibrous fracture; but the surfaces are most frequently triangular on one side. This and the conchoidal fracture with the shining or translucent appearance, distinguish it from felspar. It crystallizes in hexagonal pyramids, is harder than felspar, cannot be scratched by steel, becomes opaque when heated but does not melt without addition. Specific gravity 2.650. It is nearly pure silica. Is much used in the bodies of Pottery and in making enamel and glass.



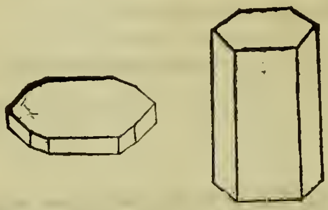
Quartz.



Crystals of Quartz.

Mica occurs usually in thin tabular plates or scales, resembling glass; it is rarely crystallized in four or six-sided short prisms or long six-sided pyramids.

Mica.



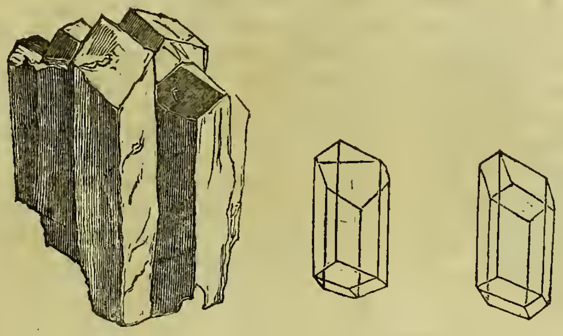
Crystals of Mica.

Constituent parts.	
Silica,...............	47.00
Alumina,...............	22.00
Oxide of Iron,.......	15,50
Oxide of Manganese,	1.75
Potass,...	13.50
Loss by heating,.....	0.25

It is easily split into thin laminæ and melts before the blow-pipe into a greyish spongy glass; it is

soft, pliant and easily scratched, it splits easily in one direction; its colors are white, yellow, brown and black. Specific gravity 2.654.

Hornblende occurs most frequently in small dark colored grains or crystals



Hornblende. Crystals of Hornblende.

Constituent parts.

Silica,........	42.24
Alumina,........................	13.62
Lime,...........................	12,24
Magnesia,.......................	13.74
Oxide of Iron,..............	14.59
Protoxide of Manganese,..	0.33
Water and loss,..	2.94

embedded in other rocks, the form of the crystals is usually very oblique, foursided prisms often found in pairs, rarely it occurs in six-sided prisms It also forms large masses of a greenish black or dark-brown color, greenish grey in the streak ; it is semi-hard and breaks into long quadrangular pieces, the fracture is shining coarse and granular ; it is rather brittle and melts into a greyish black glass before the blowpipe. Specific gravity 3.202.

TABLE OF GRANITES.

Varieties.	Constituents.	Localities.	REMARKS.
Common Granite.	Felspar, Quartz, Mica, Hornblende.	Bangalore, Vizianagrum, Naggery.	Elements. Silica, Alumina, Magnesia, Lime, Soda, Potass and Iron.
Porphyritic Granite.	Felspar in large Crystals Quartz and Mica or Hornblende.	Hyderabad, Bangalore, Seringapatam	This is an ornamental rock well suited for pedestals and slabs.
Gneiss or Stratified Granite.	Felspar, Quartz, Mica, with specks of Hornblende.	Bangalore, Bellary.	Much used as a building stone and as posts for the Electric Telegraph.
Graphic or Laminar Granite.	Felspar and Quartz in Laminæ.	Cuddapah, Ootacamund.	A rare form of Granite.
Syenitic Granite.	Quartz, Felspar and Hornblende.	Bellary, Cuddapah, Chingleput, Hyderabad.	Some varieties ornamental, a useful building rock.
Talcose Granite, or Protogine of the French.	Felspar, Quartz and Talc.	Nellore, Salem.	Too irregular in hardness to be of much use.
Schorly Granite.	Schorl, Felspar, Quartz and Mica.	Vizianagrum, Mysore, Nellore.	A brittle splintery Granite.
Eurite or fine granular Granite.	Felspar, Quartz and Mica.	Bangalore, Chingleput.	A compact durable rock like sandstone.
Pegmatite or Binary Granite.	Quartz and Felspar.	Arcot, Chingleput, Bangalore.	Much used in Pottery and in Glazes.

Granites are often found in a state of decay in the localities in which they have been first formed; various causes lead to this change, thus Felspar is acted upon by moisture and by alternations of temperature; Mica is acted upon by moisture; Quartz by Lime in solution, the silicic acid of the Quartz having a great tendency to combine with the Lime. Carbonic acid generated in the earth or taken down by rain assists materially in dissolving the Lime contained in the Felspar, and other portions of crystalline lime that are frequently associated with granites. The frequent changes in the Electric condition of the atmosphere and of the earth act upon all the constituents of granite, but more particularly upon the Hornblende which contains the oxide of iron in considerable proportion: this and the Alumina of both the Felspar and Hornblende swell with moisture and contract on drying, but the most extraordinary change that occurs in old granites and which has not yet been accounted for, is Quartz passing into an opaque soft pulverulent mass. Lyell and others attempt to explain it by the evolution of Carbonic acid gas from under ground, but it appears to be more probably due to the Electricity of the earth. Felspar in decaying forms Kaolin or Porcelain earth. Quartz is little liable to decay, but occasionally passes into a substance resembling Tripoli, but a pure silicious powder without organization. Mica decays into a yellow, brown, or green soapy earth, and Hornblende into a brownish powdery loam. These must not be confounded with the Schists and Transition formations which will be noticed in Part 2.

PRACTICAL GEOLOGY.

PART II.

SILURIAN SERIES OF ROCKS AND FOSSILS.

Resting upon the Crystalline Granites and Igneous or Volcanic rocks we find a series of strata formerly called Transition, but now called Silurian, and consisting chiefly of slates, sandstones and shales. This group is divided into the Lower Silurian consisting of dark red or purple calcareous flag stones, in which are found remains of small fishes of the shark tribe, several genera of the remarkable group of Trilobites, as Fig. 1. Parodoxides spinulosus Fig. 2. Trinucleus pongerardi, some worms as Fig. 3. Nereites cambriensis, some sea weeds, a number of chambered shells resembling the Nautilus, as Fig. 4. Lituites cornuarietis, some univalve and bivalve shells, several Echinoderms (Star fishes &c.) and some of the two principal groups of Coral Animals as Fig. 5.—Hemicosmites pyriformis. Up to this period, the other kinds of fishes, and all quadrupeds and reptiles, and a large proportion of the best known and abundantly represented generic forms of the invertebrated animals, have not been detected.

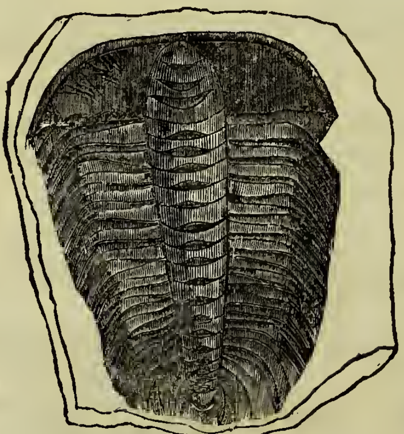


Fig. 1. Paradoxides spinulosus.

Fig. 2. Trinucleus pongerardi.

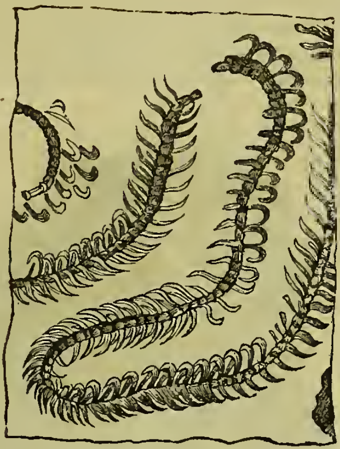


Fig. 3, Nereites Cambriensis.

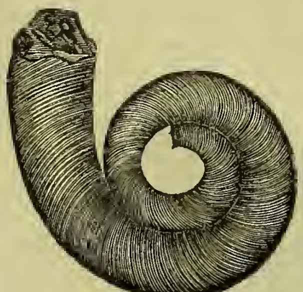


Fig. 4, Lituites Cornuarietis.

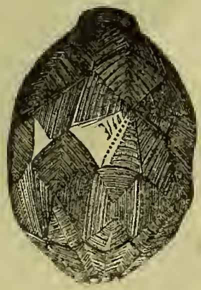


Fig. 5, Hemicosmites Pyriformis.

Fig. 6, Do.

The Trilobites, Figs. 1 and 2, were singular crustacea living in the ancient seas in great numbers, and capable it would seem of either floating with their backs downwards from the surface of shallow water, or burying themselves in mud at the bottom. Some of the Marine worms differ but slightly from those still found on sea shores. Many extensive tracts occupied with Lower Silurian rocks have hitherto yielded no fossils whatever : in other cases organic remains are rare, but there are many districts where they are abundant. The modifications and metamorphoses of the Lower Silurian rocks are often very considerable, Clays having been converted into Slates, Limestones into Marble, and Sands into Quartz rock. In the crevices are numerous veins often filled with metals and not unfrequently metallic sulphurets, containing a marked proportion of gold. The slates, sandstones and shales of the Bellary, Cuddapah, Nundial and Mysore districts ought to be carefully searched for Fossils of the Lower silurian group.

THE UPPER SILURIAN SERIES.

This consists chiefly of Tilestones or finely laminated reddish and greenish sandstones and shales, which usually rest upon micaceous Sandstone, argillaceous Lime, and Shale, to which the name of the Ludlow group is given in England. These rest upon concretionary or Mountain Limestone and argillaceous Shale called, the Wenlock group. The Limestones of the series are loaded with clayey matter and the shales are very calcareous, so that the whole may be regarded as an impure mud deposit, which has since undergone change. The characteristic Fossils of the upper Silurian rocks are Trilobites of the genus Calymene, Fig. 7. Corals of a peculiar kind, Cyathophyllum Coespitosum, Fig 8, and some interesting radiated animals called Encrinites, of the genera Hypanthocrinites and Dimerocrinites, Fig 9. besides univalve shells of the genera Leptaena, Fig 12, and Pentamerus Fig 13. The remains of fishes are rare in the Silurian rocks, but they have been found in some localities in considerable abundance. No indications of reptiles have yet been met with in this group, and this agrees beautifully with the Mosaic account of the creation detailed from the 20th to the 23d verse of the first chapter of Genesis ; it is probable that the

fifth period, or day, corresponds with the creation of the Primitive formations as far as the end of the next series the Devonian or old Red sandstone, in which no remains of air breathing animals have yet been discovered. The silurian strata attain in some places to a great thickness, the upper beds being occasionally 8,000 to 9,000 feet, and the lower, with the associated Slates and Greenstones or Traprocks, 15,000 feet.

Fig. 7, Calymene.

Fig. 8, Cyathophyllum Coespitosum.

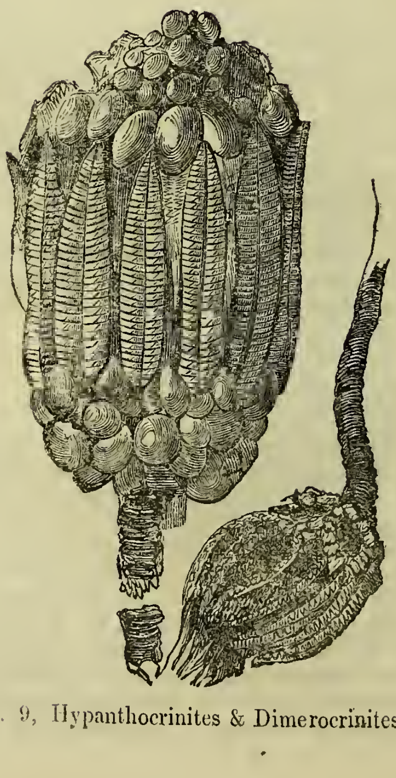


Fig. 9, Hypanthocrinites & Dimerocrinites.

Fig. 10. Lingula.

Fig. 12, Leptæna.

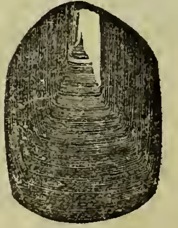


Fig. 11, Lingula.

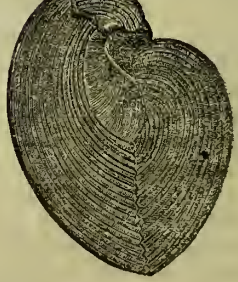
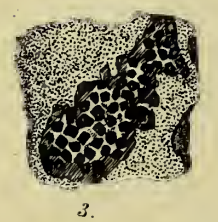


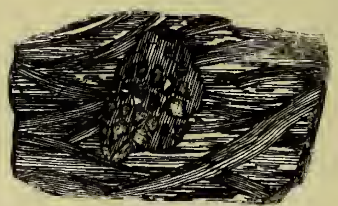
Fig. 13, Pentamerus.

1.
Scale of Holoptychus

2.
Head-bone of Cephalaspis and Scales.



3.
Eggs of gasteropodous mollusk.



4
Fucoids and Eggs of mollusk

5.
Spawn of Naticæ.

Fossils of the Old Red Sandstone.

6.
Pterichthys.

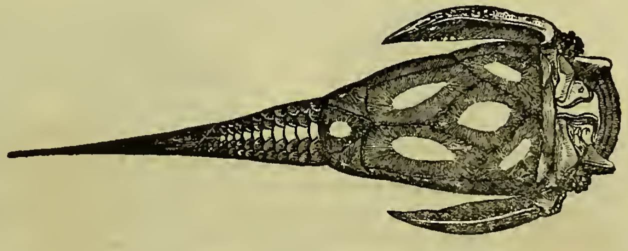
PRACTICAL GEOLOGY.

PART III.

THE OLD RED SANDSTONE SERIES.

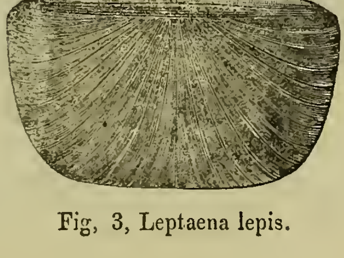
Immediately above the Silurian strata we find a series consisting chiefly of dark red or purple sandstone, conglomerate, and shale with few fossils. The upper part of this formation, when it crops out of the ground, is frequently a coarse quartzose conglomerate, resting upon finer grained chocolate red and green sandstone and marl, under these are layers of red and green argillacous spotted marls, with irregular courses of impure concretionary limestone, called sometimes cornstone. Fossils are extremely rare in the clays and standstones in which the red oxide of iron prevails, but the remains of fishes of the genera Cephalaspis and Onchus have been found in the cornstone. The old red sandstone sometimes rests upon the granite rocks without the intervention of the Silurian strata, occasionally the two are blended so as to be distinguished with difficulty. The red and mottled marls occasionally contain the remains of gigantic fish of the genus Holoptychius. The scales of this fish are occasionally from two to three inches in size. One of them is figured in the accompanying plate. Immediately under the conglomerates there are occasionally found remains of a curious kind of fish called the Bucklerhead or Cephalaspis, and in the sandstones or paving stones, which form the next strata, the remains of marine plants or fucoids abound; these fucoids are occasionally interspersed with the eggs of Gasteropodous Mollusks, bearing a great resemblance to the spawn of living species of Natica, often seen deposited in recent layers of sand. Under the beds of dark red shale and sandstone are sometimes found slaty grey sandstones, containing the remains of ganoid fish of the genera Pterichthys or winged fish, Coccosteus, Cheir acanthus, &c., characterised by having bony enamelled scales and wing like appendages. The name of Devonian is sometimes given to the old red sandstone formations, as they abound in Devonshire.

There are considerable differences in this series of formations in different countries: thus they occasionally consist of sandy, muddy, and slaty beds, resting on Silurian strata, and containing corals, shells and trilobites. At other times of vast masses of rolled materials consisting of quartz, pebbles, gravel, and sandstone, resting upon granite and intersected by occasional bands containing the remains of fishes. The coarse sandy and gritty strata seldom contain fossil remains. Occasionally the strata consist of chlorite or roofing slates alternating with hard quartzose slates, sandstones and blue lime. The fish of this period seem all to have been odd and uncouth, with a bony outward framework. The accompanying, Fig. 1,—Pterichthys Cornutus, shows the large size of these bony plates. The jaws were provided with sharp pointed teeth, the head inclosed in a cartilageous box coated with enamel, the scales on the body are so disproportionately large that they do not exceed six in number between the head and tail. These fishes probably swam rapidly and inhabited deep seas, but they were of small size and few genera of them have yet been detected; similar tribes of larger size, and more powerful, appeared towards the close of this period. Among the corals we find the genera Favosites and Cyathophyllum on the one hand common to the Mountain limestone, and on the other to the Silurian; Fig. 2.—Auropora serpens is also common. In regard to the shells, all the brachiopodons genera as Terebratula, Orthis, Spirifer, Atrypa, and Productus, which, are found in the mountain limestone, occur together with those of the Silurian system, except Pentamerus.—Leptaena lepis Fig. 3. is one of this class.



Pterichthys Cornutus.

Fig. 2, Auropora serpens.



Fig, 3, Leptaena lepis.

Among the Cephalopoda we find Fig. 4.—Clymenia, also Belerophon and Orthoceras as in the Silurian and Carboniferous groups, Fig. 5.—Turbo subcostatus. Fig. 6.—Pentremitidea and Fig. 7.—Conularia Ornata also belong to the old Red Sandstone. Up to this period there are no indications of land plants or animals.

Fig. 4, Clymenia.

Fig. 5, Turbo subcostatus.

Fig. 6, Pentremitidea.

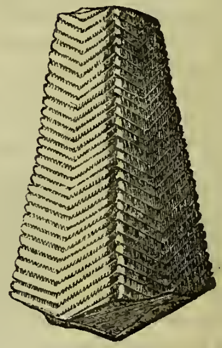


Fig. 7, Conularia Ornata.

PRACTICAL GEOLOGY.

PART IV.

MOUNTAIN LIMESTONE.

This is also called Carboniferous Limestone, as it is usually associated with the Coal measures, or alternates with the shales and sandstone of the lower part of the Coal, while it rests upon the old Red Sandstone or Silurian strata. The line of demarcation between these strata is by no means distinct, and they often pass into each other, or are nearly lost by the excess of one or other formation. Thus the old Red Sandstone is sometimes wanting and the Mountain Limestone rests on Silurian strata; or these may be deficient and the red Sandstone will be found resting on the granite.

The Mountain Limestone is often rich in Fossil remains, though occasionally it is destitute of them. Corals are the most abundant, and these are often of a large size.

Crinoidea are also abundant, as Fig. 1, Encrinital stems, and Fig. 2, Cyathocrinites and Hypanthocrinites, already figured, in the upper Silurian series.

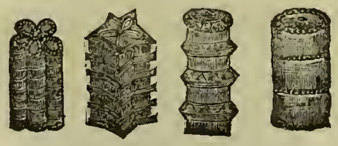


Fig. 1, Encrinital stems.

Fg. 2, Cyathocrinites.

Among the Brachiopoda are Spirifer Hystericus Fig. 3. and the extinct genus Leptaena now called Productus. Of the spiral univalve shells the extinct genus Euomphalus is also common ; this differs from the nautilus in having no siphuncle or perforation between the divisions.

Fig. 3, Spirifer Hystericus.

There are several univalve and bivalve shells of existing genera as Turritella, Buccinum, Patella, Isocardia, Nucula and Pecten. Fig. 4. Fusulina cylindrica is of frequent occurrence in the Mountain Limestone.

Fig. 4, Fusulina Cylindrica.

Of the class Cephalopoda the Orthoceratite, Fig. 5, a Siphuncled and chambered shell like a straight Nautilus is abundant. The genera, Goniatites, Fig. 6, and Bellerophon, Fig. 7, are also abundant, and are not found in strata of later date. The shell of the latter, B. costatus, is without chambers and resembles the living Argonaut : of the same class is the Nautilus Koninchii, Fig. 8. Of the Class of Trilobites a small circular species Limulus rotundus, Fig. 9, is not uncommon. The Chonetes Dalmaniana Fig. 10. is also confined to this formation. As yet we do not come to the remains of any land plants or air breathing animals, though the next series the Carboniferous or Coal bearing abounds with vegetable life.

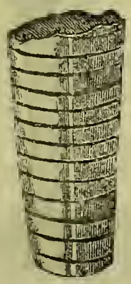


Fig. 5, Orthoceratite.

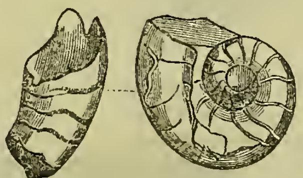


Fig. 6, Goniatites.

Fig. 7, Bellerophon.

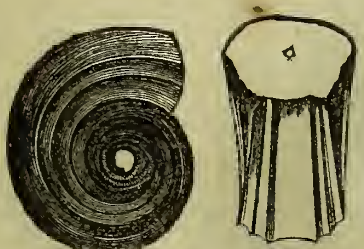


Fig. 8, Nautilus Koninchii.

Fig. 9, Limulus Rotundus.

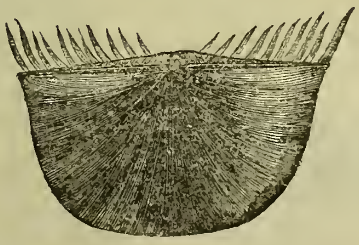


Fig. 10, Chonetes Dalmaniana.

The Mountain Limestone sometimes acquires a thickness of from 2 to 3,000 feet. Those varieties that do not contain Fossil remains often abound in Sulphurets of Iron, Lead and Copper. The Localities in this Presidency where this formation is likely to occur are the Naggery range of Hills and parts of the Nellore and Cuddapah Districts.

PRACTICAL GEOLOGY.

PART V.

THE COAL FORMATIONS OR CARBONIFEROUS STRATA.

Of all Geological formations this is perhaps the most interesting and important to man whether we consider the value of the Coal, the Iron, Lime and Fireclays which they produce, or the peculiarity of the fossil remains which differ most materially from those of the other formations and consist chiefly of Tree Ferns, gigantic Arboresent reeds, and Club mosses.

Some geologists divide the Carboniferous strata into three sections. The uppermost of which the coal measures consists of shale, sandstone, and grit, interpersed with coal in seams. The next section is millstone grit a coarse quartzose sandstone passing into conglomerate and usually devoid of coal. The lowest section is the Mountain or Carboniferous Limestone already described, as containing marine shells and corals but no coal. This division of the Carboniferous group appears however to be more suited to the Geology of England than to that of most other countries, as the Millstone grit and the Mountain Limestone seldom attain the thickness that we find them acquiring in parts of Great Britain. One peculiarity of the Coal measures is the regular parallel succession of strata of sandstone, shale, coal and clay, with occasional bands of Iron and Lime; the two latter are not invariably met with, but each seam of coal is covered by sandstone and shale while it rests upon a bed of clay; in some districts as many as 200 alternate strata of various thickness have been counted, but when so numerous the seams of coal amongst them are seldom of any great thickness.

The number of Carboniferous fossil plants already described amounts to upwards of 500 species; many of these are ferns, some of which and of the Coniferæ bear a striking resemblance to species now existing; the other fossils of this class are very unlike existing genera or species.

Among the ferns are Pecopteris Fig. 1, and Sphenopteris Fig. 2, *a. b.* which resemble ordinary European Ferns in size and in the general appearance of the fronds. Others like Fig. 3, Caulopteris, were large and arborescent with scars or cicatrices left after the fall of the frouds.

(See Copper Plate Illustration.)

FERNS OF THE COAL FORMATIONS.

Another form of fossil, very abundant in the Coal formations, is the Lepidodendron Fig. 4, a tree Fern with delicate diamond shaped tracery on the stem and elegant luxuriant waving fronds. These Ferns attained a height of 40 to 60 feet and belong to the family of Lycopodiums, the largest of which now living seldom attains a greater length than 3 feet.

The accompanying illustrations Figs 5 and 6 show the characters of the stem and fronds of the genus

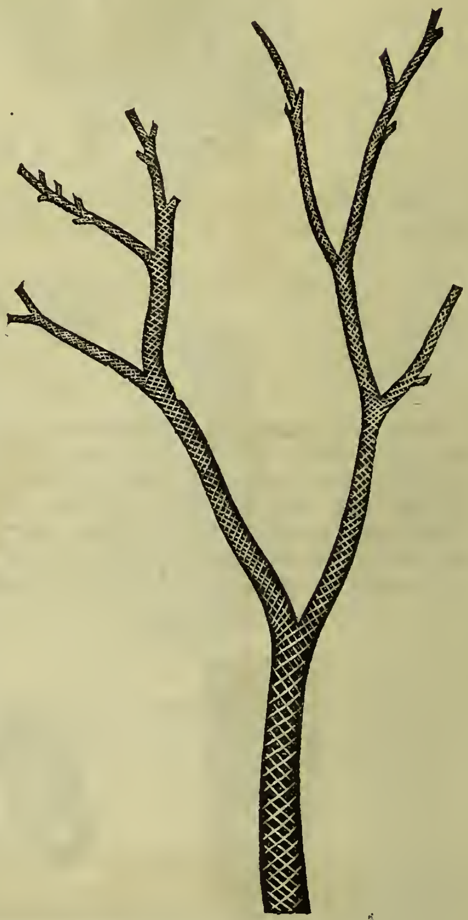
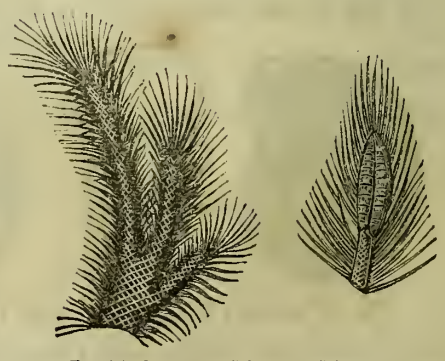


Fig. 4. Lepidodendron.



Lepidodendron Fig. 5. Fig. 6.

Fossil Ferns of the Coal formations.

Lepidodendron and Fig 7 the general appearance of the Tree fern. Along with these are frequently found elongated bodies called fossil cones, Fig. 7 *a.* to which the name of Lepidostrobus has been applied: these are considered to be the fruit of the Lepidodendron. Another family nearly allied to the living Equisetites but attaining to a much more gigantic size is the Calamites (Fig. 8, and 9, of copper plate illustration;) some of which differ from the common recent horse tail in having jointed stems and a thin cuticle which, when removed as in Fig. 9, shows a pattern differing from the striped external appearance of the Fossil. The calamites of the coal, sometimes acquired the height of small trees. Another form of Tree fern nearly allied to the last is the Calamodendron, and an elegant genus, the Asterophyllites, Fig. 10, which, from its pith and medullary rays, appears to have been a dicotyledonous plant. A large portion of the trees of this period belong to the extinct genus Sigilaria, the bark of which is marked with cicatrices resembling the stamps of seals, Figs. 11 and 12—hence the name; they had long linear leaves and an internal organization resembling the Cycadæ; they attained a height of from 30 to 70 feet. Their roots which present a different appearance were long known under the name of Stigmariae and supposed to be a different plant. Fig 13 represents the Stigmaria ficoides about ¼th the natural size. Fig. 14, Sphenophyllum dentatum is an elegant plant of the Coal formations. The Fossil trees of these formations all belong to the Class of Endogens or Monocotyledons and to the Acrogens or Cryptogamous Tree Ferns.

Fig 7. Tree Fern.

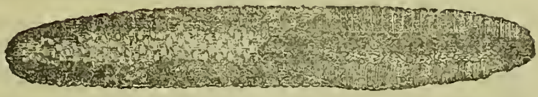


Fig. 7, *a.* Lepidostrobus.

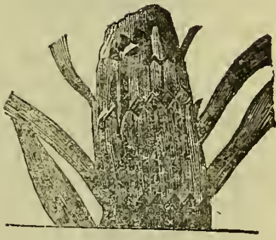


Fig. 8, Calmite.

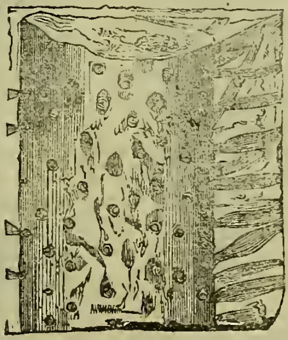


Fig. 13, Stigmaria Ficoides.

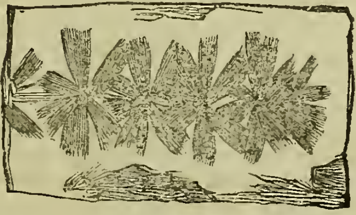


Fig. 14, Sphenophyllum dentatum.

The entire absence of Exogens or Dicotyledons the common Trees now living is remarkable.

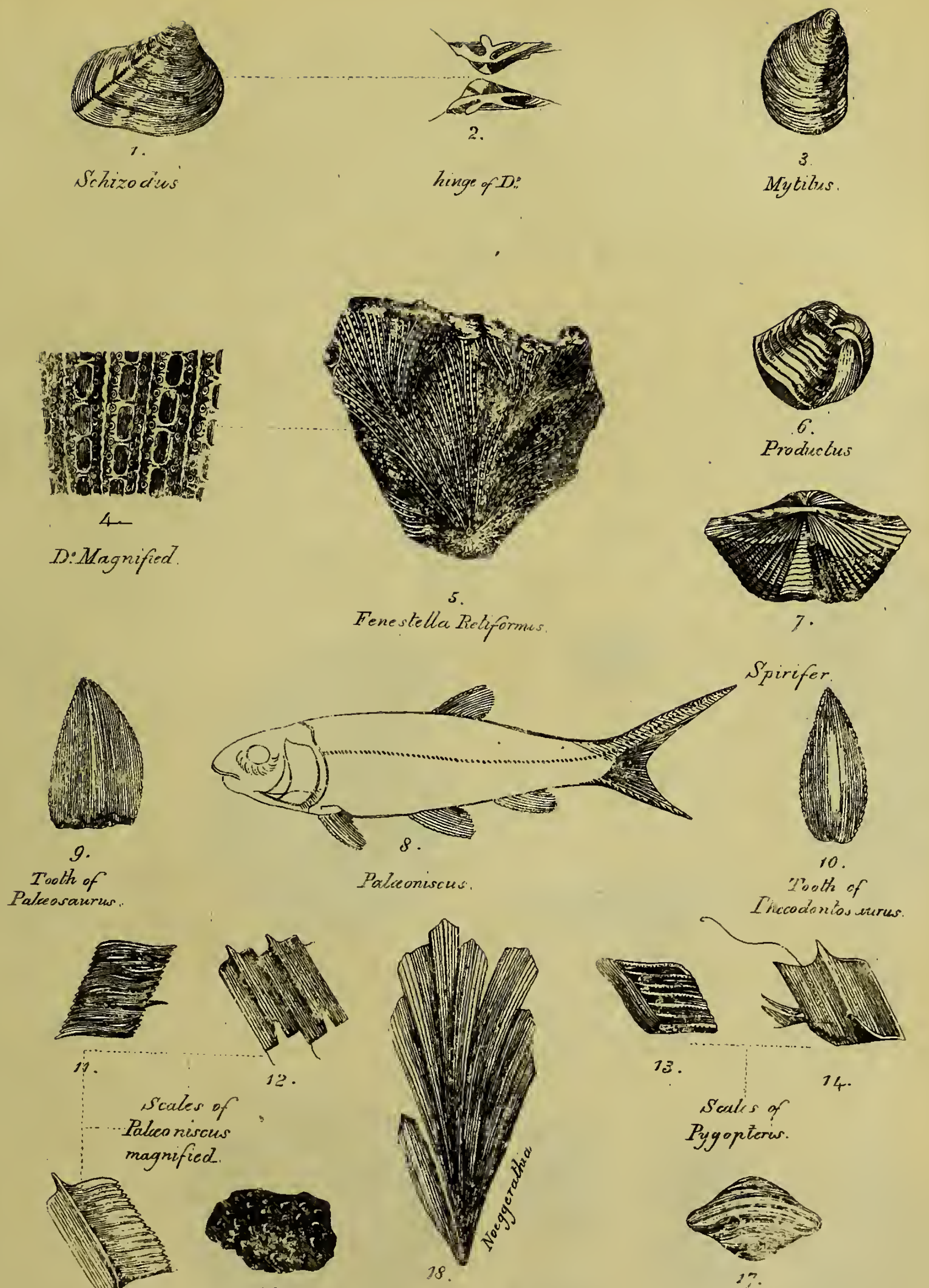
PRACTICAL GEOLOGY.

PART VI.

THE PERMIAN OR MAGNESIAN LIMESTONE GROUP.

The term Permian is derived from Perm a district in Russia where the strata are more largely developed than elsewhere. The Magnesian Limestones of this group vary much in color, character and general appearance. The upper strata are frequently of a pale grey, pink, yellow or white color, either crystalline or concretionary. These are followed by a compact non-crystalline limestone, varying in color from yellowish grey to brown or black. These usually rest upon layers of brecciated amygdaloidal or plumpudding looking limestone of grey or reddish brown colors. Under these are compact grey flinty looking Limestones called Dolomites which frequently pass into a flinty slate or a coarse Marly slate. The lowest stratum of the series is generally Magnesian sandstone of different colors, dark, red, purple, or black. Various Fossil remains occur in these strata, but the whole Permian series is less prolific in fossils than the new red sandstones which occur above and the coal measures which are usually found immediately below the Magnesian Limestones. There are two satisfactory reasons to account for the comparative paucity of fossils ; one is, that the upper parts of the strata often contain metallic sulphurets as those of Lead, Iron, and Copper which prove injurious to animal life, and Magnesia in large quantities is equally destructive of vegetable life. The fossils which occur in the upper pale colored crystalline or concretionary strata are shells of the genera Schizodus and Mytilus Nos. 1, 2 and 3. The succeediug compact non-crystalline Limestones which usually contain sulphurets of metals aud the brecciated strata are almost destitute of fossils. The next strata which consist of compact slaty limestones and dark Dolomites contain a few fossil corals like the accompanying. Nos. 4 and 5 Fenestalla and shells of the genera Productus No. 6 and Spirifer No. 7. The Marl slates usually contain the remains of fish of the genera Palæoniscus, Fig. 8, Pygopteris, Acrolepis &c. nearly all characterized by having Heterocercal or unequally lobed tails. There is a great variety in the seales of the Fish found in these Marl Slates. Magnified representations of some of them are shown, Figs. 11 to 17. In the Dolomitic conglomerates there are frequently found broken pieces of bones and teeth of large reptiles of the genera Thecodontosaurus and Palaeosaurus. These teeth, Nos. 9 and 10, are conical in form, compressed, and with finely serrated edges. The inferior sandstones which separate the Marly Slates and Magnesian Limestones from the coal formations are usually rich in fossil plants nearly allied to those of the true Carboniferous Series as Cycadeae and Coniferae of the Araucarian division, one of these, No. 18, Noeggerathia, is here figured; it is supposed to be allied to Cycas a Tree Fern.

As regards the ecomic uses of these Limestones the upper strata may be considered as the great depositories of some of our most useful Metals, as Copper, Lead, Silver, Zinc, and Iron pyrites. The compact non Crystalline Limestones are found to be suited for Lithographic purposes and sharpening stones. The coarser varieties for paving and building pnrposes, while the greater part of the limestones and sandstones are suitable for building purposes, and are found to be very durable, while those containing above 20 per cent of magnesia and the dark Dolomites, yield excellent Hydraulic mortar, that sets under water and does not suffer from exposure to sea air. Magnesian Limestones are known to occur over a large extent of country in the Cuddapah, Kurnool, Bellary and Guntoor districts, from which they extend across the country to Kaludgee, Hurryhur and the Southern Maharatta Districts. The upper strata as above described, have, in the Cuddapah and Kurnool Districts, been found to be rich in Lead, Silver, and Iron Pyrites, with here and there traces of Copper and Zinc. Lithographic and sharpening stones are also plentiful and several of the Limes and Dolomites have been tested and found to be possessed of excellent hydraulic properties, but as yet few of the Fossils of the series have been found in this Presidency. Black Limestones, Dolomites and Plumpudding like stones have however been found at Koondoopalpaud near Gooty, Cuddapah, Tarputre, Nundial and Dhone near Kurnool, and at Goodepaud, Nerdicherla and Booragul in Bellary. All these Limestones, except the one from Nundial, owe their color to Carbonaceous matter, and burn to a white, hence the presumption is that they may rest on the true Coal formations, as they do in most other countries ; but in order to determine this, Fossils must be found. A reward of 10 Rs. will be given to any one who produces any of the above fossils in Magnesian Limestones or Sandstones in the Madras Presidency, and a reward of 50 Rs. to any one who produces fossils of the true Carboniferous series and will show the locality where they were found. The specimens to be sent to the Madras School of Arts, Vepery.



Fossils of the
Permian or Magnesian group

PRACTICAL GEOLOGY.

PART VII.

NEW RED SANDSTONE SERIES.

Resting upon the Magnesian Limestone or Permian series, we find a succession of strata sometimes of great thickness, and composed chiefly of sandstones, grey shales and red or yellow loams. This has also been called the Poikilitic or variegated strata, from their exhibiting spots and streaks of light blue, green and buff color in a red base. In some countries, as Germany and Southern India, these strata are much more developed than in others. They have been subdivided into three classes.

1. The saliferous or Keuper of the Germans, consisting of Gypsum, Land salt, shales, and sandstones.

2. The Muschelkalk, a limestone frequently containing Magnesia, and full of large and small fossil shells of the Mussel genus, from which it derives its name (this stratum is wholly wanting in England).

3rd. Sandstone and quartz conglomerate or Roestone, the Buntersandstein of the Germans.

The name of Trias or triple group has been applied to the New Red sandstone of Germany, as it there presents the above three well marked divisions. The saliferous or Keuper, consists chiefly of beds of sandstone with thin strata of Gypsum, Land or Rock salt, red marble, and grey slate clay. It contains the remains of reptiles as the Labyrinthodon Fig. 1. The remains of Turtles. The detached teeth of placoid fish and scales of the genera Sauricthys and Gyrolepis. The plants consist of ferns, Cycadeæ and Coniferæ with a few Equisetaceae and doubtful Monocotyledons.

Fig. 1, Labyrinthodon.

The Muschelkalk consists of yellow and grey compact Limestone without Belemnites or Ammonites which are plentiful in the incumbent strata but a genus allied to the ammonite called Ceratite Fig. 2, which has only small denticulations and not the large foliated sutures of the Ammonite. Among the Bivalve shells are the Posidonia Minuta, Fig. 3. and Avicula socialis Fig. 4, which range through the whole series of Keuper, Muschelkalk and Bunter sandstein. The heads and stems of the Lily Encrinite Fig 5, are also met with. The starfishes or Uraster Fig. 6, are also peculiar and some of the univalve Shells as Lottia lineata Fig. 7, or the Triassic limpet and bivalve shells as Myophoria lineata Fig. 8. These are sufficiently distinct to be easily recognised.

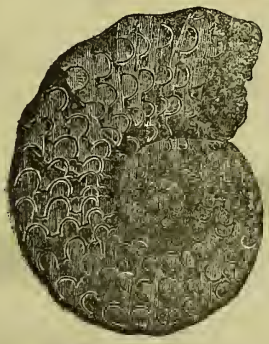


Fig. 2. Ceratite.

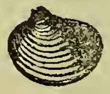


Fig. 3. Posidonia minuta.

Fig. 4. Avicula socialis.

Fig. 5, Lily Encrinite.

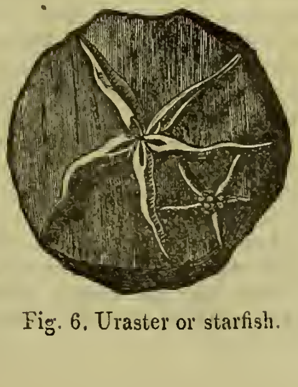


Fig. 6, Uraster or starfish.

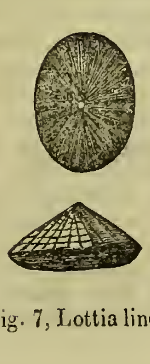


Fig. 7, Lottia lineata.

Fig. 8, Myophoria lineata.

Among the zoophites the Stellispongia variabilis Fig. 9, and a few other species are plentiful.

The Bunter sandsteiu consists of various colored sandstones, dolomites and red clays with occasionally beds of calcareous pisolite or roestone: the plants are coniferae of the extinct genus Voltzia Fig. 10, Cycadeae and Ferns ; the foot prints of the Labyrinthodon are also found on the upper surface of these beds. The lower strata do not contain many Fossils and they pass into the Magnesian Limestone or Permian series.

In the New red sandstone of England there occurs a dark colored stratum known as the bone bed, and containing the remains of Saurians and the teeth of Fish of the genera Hybodus, Fig 11 and 12 Acrodus, Gyrolepis and Saurichthys, spines of the Hybodus called Icthyodorulites Fig. 13 are also common. The sandstones below these strata are often destituteof Fossils to a considerable thickness. In Great Britain the lower part of the series or what corresponds to the Bunter Sandstein attains often a thickness of 600 feet aud consists of red and green shales, and red sandstones, resting upon thick beds of white quartzose Sandstone in which are occasionally found the trunks of silicified Trees. These are in fact the quarries from which much of the building stone called freestone is obtained. This is the first or earliest formation in which we find the remains of air breathing animals and corresponds probably with the beginning of the sixth day of the Mosaic account in the 24th verse of the 1st Chapter of Genesis. We have already seen that the remains of fish and crustaceans inhabiting the seas are plentiful amongst strata of older date.

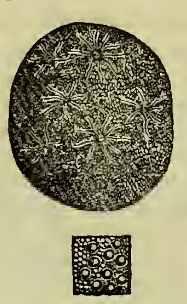


Fig. 9, Stellis pongia variabilis.

Fig. 10, Voltzia.

Fig. 11, Teeth of Hybodus.

Fig. 12, Teeth of Acrodus.

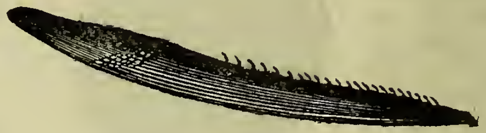


Fig. 13, Icthyodorulites.

The Madras Presidency abounds with sandstones, many of which present the general characters and outward appearance of these belonging to the New Red sandstone formations, but their relative age has not in many instances been determined from the absence of Fossil remains. If we except the remains of Fossil Trees found in a few of the sandstone quarries in Great Britain, this series of strata will be found to be nearly destitute of Fossils, which are chiefly found in the layers of Marl, clay slate or calcareous lime which intersect the strata of sandstone. Attempts have been made by Benza, Newbold and other geologists to establish a new class out of the Diamand sandstones so abundant in the Guntoor, Masulipatam, Hyderabad and the Ceded Districts, but the probability is, that if the strata below them and particularly the limestones were carefully searched, Fossils would be found, from which the relative age of these sandstones might be determined; the existence of Diamonds in these strata proves that carbonaceous matter in some form occurs below them, and as a few of the sandstones are very compact, and bear a close resemblance to those of the New Red sandstone series, it is not improbable that coal might be found under them: another fact which strengthens this belief, is, that the same districts which yield the Diamond sandstones are those in which Magnesian Limestones which usually rest upon coal are so plentiful. Variegated sandstones resembling the Saliferous or Keuper occur plentifully in the Cuddapah, Mysore, Bellary, and south Arcot Districts where they are usually accompanied by Gypsum and land salt. An extensive bed of the Muschelchalk with some of the fossils above described occurs at

Ootatoor and a stratum resembling the bone bed between this and Trichinopoly. A black slaty substance resembling Parrot Coal was found between Ootatoor and Vellum by the late J. T. Boileau Esp. and was sent to the London Exhibition of 1851. Saudstone and Quartz congolmerates resembling the New Red sandstone, Millstone grit, and roestone occur in the Cuddapah, Bellary and Kurnool Districts, where further search for fossils should be made. The great object aimed at in publishing these illustrated articles on Practical Geology was to try to induce parties to make a proper search for coal in the Madras Presidency. The above series which describe and illustrate the fossils and strata nearest to the coal, have been prepared with the view of communicating information on this subject.

ALEX. HUNTER,
Reporter.

CLASS III.

REPORT ON SUBSTANCES USED FOR FOOD.

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R. Burgass, Esq.
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J. Goldingham, Esq.
A. T. Jaffrey, Esq.

The execution of the duties confided to the Jury appointed for Class III was in the outset considerably retarded by the absence of any Catalogue, except that, drawn up for Districts, which it was found could afford but little assistance. Two Meetings were held, but from the cause named, together with the difficulty of finding the sample which were placed, some here, and some there, the Jury were compelled to relinquish further attempts until a Class Catalogue could be procured, or until some order, that would permit of viewing all the samples of one kind together, could be determined on. After an interval of more than a month, seeing that it had been resolved to close the Exhibition, the President and the Reporter, who had at the last meeting of this Jury, been requested to prepare a rough report, determined to do what was in their power. They met at the Hall and employed several days in arranging with their own hands and in counting, comparing, and valuing every sample of Grain in Ear, in Husk, and in the prepared state—the same labour was gone through with the Pulses, the starches, the sugars, Jaggries and syrups, with the Coffee, Wines &c. In forming their judgment, especially with respect to the Rice and Paddy—the Sub Jury were assisted materially by two Native Grain Dealers, who attended at the request of Colonel McCally, and by Native Surgeon Appavoo, Assistant to the Professor of Botany in the Madras Medical College. In deciding on the quality of Rice, it was evident that the Native Dealers attached a superior quality and value to the smaller and whiter varieties; but whether fashion and Eastern ideas of high caste and what is fit for high caste, may not have had more weight in these valuations, than any real superiority in these varieties of rice, remains to be decided. As a means of repairing animal tissue, the value of Rice, as well as of all other grains when considered as food will depend on the percentage amount of albuminous matter present: the question is therefore, whether the smaller varieties of rice contain a higher percentage of albuminous matter than the larger kinds. That fashion or a peculiar education of the palate gives a fictitious preference to one kind of grain over another is clear from the well ascertained fact, that rice is esteemed in India and other parts of Asia more highly than Wheat, Cumboo, Cholum, Ragee, &c yet as will be seen hereafter every one of these grains contains a larger percentage of strictly nutritious matter, i. e. matter capable of repairing the animal tissues.

The Tabular form of exhibiting results being the most concise, as well as in many cases, where comparison is required, the best, a series of Tables, has been drawn out. The first of these, shews merely, the names of the different kinds of food affording substances, with the number of samples under each name. The positive information conveyed by this table is therefore very limited. Not so however, the negative; as it proves at a glance that the innumerable host of European Fish meat and Fowl, whether potted, pickled, smoked, salted, dried, or preserved fresh, with all the soups and boullies, cheeses &c. are not included in the Indian or Hindoo category of substances employed as Food: neither milk, butter nor eggs find place in this list. In a word there is nothing to be found belonging to the animal kingdom—all here is derived from the vegetable, or primary, division of organized nature—so aptly designated by Liebig, as the living workshop, in which the food of animals is prepared, and in which unorganized mineral substances, are converted into parts of living organisms.

TABLE No. 1.

ARTICLES.	No. of specimens	REMARKS.
Grains, ...	1,014	* Thus it appears that nearly 1,400 samples of vegetable substances, more or less generally employed as Food, have come under the observation of the Jury appointed to report on this class.
Starches, ...	74	
Sugars, ...	66	
Spices, &c., ...	171	
Substances employed in forming Drinks, such as Coffee, Tea, Cocoa, ...	33	
Intoxicating Drugs, ...	16	
Do. Liquors, ...	16	
* Grand Total...	1,390	

TABLE No. 2.

Showing varieties under each heading.

Table No. 2 shews not merely names and numbers in gross, but varieties under each name, and the numbers of these varieties that go to make up the Total shewn in Table No. 1.

CEREALS.	Varieties.	PULSES.	Varieties.
Paddy (Oryza sativa,)	525	Cassia Bark	2
Wheat (Triticum,)...	25	,, Buds	1
Barley. Hordeum vulgar, ...	1	Cloves	8
Maize, Zea-Mays, ...	28	Cardamoms	14
Great Millet or Cholum (Sorghum vulgare,) ...	56	Coriander	14
Andropogon or black Cholum, ...	3	Chillies	9
Tenay or Italian Millet P. Italicum, ...	21	Black Pepper	12
Sawmay (Panicum miliare), ...	25	White Pepper	5
Caday-canny or Little Millet, ...	8	Betel leaf	1
Pil-arisee or Little Millet, ...	13	,, Nut	22
Varagoo or Little Millet (Primiliaccum,) ...	30	Ginger	9
Raggy Eleusive Coracana,...	28	Turmeric	3
Cumboo-Spiked (Millet P. Spicata,)	26	Fenugreek	12
Bamboorico (Bambusa), ...	3	Cummin-seed	10
Grass-corn, ...	1	Dholl-Toovaray Cajanus Indicus, ...	35
	——	Oolundoo or Mash. (Phaseolus radiatus,)	16
	793	Green gram or moong (Phaseolus mungo,) ...	33
SUBSTANCES USED TO MAKE DRINKS.		Gram-Coolthi (Dolichos uniflorus,) ...	24
Coffee, ...	31	Mussoor (Ervum lens,)...	2
Tea, ...	1	Wild Gram, ...	15
Cocoa, ...	1	Peas (Pisum Sativum,)...	7
	——	Bengal Gram (Cicer arietinum,)... ...	30
	33	Buller (Lablab vulgaris,)	20
	——	Caramany (Lablab cultratum,)	29
Intoxicating Drugs &c.		Beans, ...	7
Tobacco, ...	14	Raj-Jeera (Amarantus,)	3
Ganjah.	2		——
Wine and Spirit, ...	6		221
Spirituous drinks	7		——
Vinegar	3	*Starches.*	
	——	East Indian Arrowroots,...	3
	32	Tapioca, ...	1
	——	West Indian Arrowroots, ...	2
Spices, Condiments &c.		Other Samples, ...	21
Nutmegs	10		——
Cinnamon	6		27

TABLE No. 2.—*(Continued.)*

CEREALS.	Varieties.	PULSES.	Varieties.
Salep, ...	2	Womum	7
Vanilla, ...	1	Cleome viscosa	2
	——	Mustard	2
	3	Tamarind, ...	1
		Carraway, ...	1
Starches from Talipot Palm, ...	4	Garlic, &c.	7
Sago, ...	2		——
Palmyra root Starch, ...	5		171
Plantain meal, ...	4	*Sugars.*	——
Amarantus frumentaceus, ...	2	Cane, ...	45
Mango Starch, ...	1	Date, ...	5
Cot-Sambul Starch, ...	1	Palmyra, ...	10
Singara Starch, ...	1	Cocoanut, ...	5
Bombax heptaphylla, ...	1		——
Yams, ...	19		65
Unclassified Specimens, ...	4		——
	——	Honey—various samples; that from Cudda-	
	74	pah best; second that from Wynaud; third	
Aniseed	7	that from Hydrabad, ...	1
Dill	4		——
Nigella Sativa	2		1

TABLE No. 3.

Grains in the Ear.

Table No. 3, shews not merely varieties under each head, and their number, but the Districts in which they were grown, and the names of the contributors: finally, it embodies such information or remarks on individual samples or varieties, as may have struck the Sub Jurors, or have come to their knowledge. This table, in short, affords almost all the data which the Sub Jury have had before them in drawing up the following Report, independent of such special knowledge as they may have brought to bear on the subject, and of such information as could be obtained from the few acknowledged authorities at hand.

DISTRICTS.	Paddy.	Varugoo.	Tenny.	Cumboo.	Ragee.	Cholum.	Barley.	Indian Corn.	Remarks by the Sub Committee.	Confirmation or otherwise with remarks by the General Committee.
Trichinopoly,	21	...	...	...	...	4	...	...	BEST.	
Mangalore, ...	13	3	2	...	1	2	...	...	Little Millet best—Italian Millet fine quality.	
Chingleput,	5	...	...	...	..	...	...	...	Specimens of fair quality.	
Cuddapah, ...	...	1	...	4	...	2	...	...	Little Millet best, Cumboo very fine.	
Pondicherry,	...	...	..	...	...	5	...	...	Specimens of fair quality.	
Neilgherries,	...	...	...	...	...	...	1	...	Barley from Neilgherries, inferior to the European.	
Madras, ...	...	...	...	...	...	...	...	1	By Major Maitland, very fine, deserves Honorable mention.	
Nameless, ...	1	...	...	...	...	...	...	...		

TABLE No. 4.

Shewing the number of Samples of Paddy grown in the different Districts named below.

Where grown.		No. of Samples.	Names of Contributors.	Remarks by the Sub-Committee.	Confirmation or otherwise with remarks by the General Committee.
Bellary, ...		2	Local Committee,..	Stated to be 1st and 2nd sort. The Local Committee report that various sorts of Paddy are abundantly cultivated in this District.	
Chingleput, ...		51 & 31	Rungacharloo and others ...	Some fine and some inferior specimens. Manuary sumba best.	
Coimbatore, ...		1	Kistniah	The specimen exhibited is Bamboo paddy.	
Hyderabad, ...		13	Captain Taylor, ..	All good—the best is red Paddy.	
Madras, ...		5	Ramasawmy Chetty,	The best is kada Calthaim.	
Tinnevelly, ...		10 & 1	Vatudavoo & others,	All of good quality—the best Anny Comboo.	
Malabar.		8	... ...	Inferior quality.—Rajamunny, is said to be the best.	
Do. ...		12	Mr. B... ...		
Do. ...	Paddy.	2	Do, ...		
Masulipatam,...		12 & 2	Local Committee,	All good—the best is Ragavoloo Paddy.	
Pooddoocottah,		4	Tondiman Rajah,	All inferior.	
Tanjore, ...		190	Hurry Row, ...	Of all the samples, which are generally very good, that called venthia sumba is regarded as the best: it is considered most agreeable to the taste. As a whole, this collection surpasses all the others.	
Travancore, ...		65 & 22	Local Committee,	Of all these, Seeraga sumba is the best—it is said to be of delicate flavor. This collection ranks second.	
Paulghaut,... ...		44	Nellicherry Seevaram	Rajahnum Paddy, said to be very delicious in flavor, as a whole about equal to the quality of Travancore.	
Mysore, ...		12	Kistnasawmy, ...	All good—best Yalacki Raj.	
Kurnool, ...		2	... ...	Ordinary quality.	
Cuddapah, ...		20	M. Murray Esq. ...	All good, best is Pashanum.	
Pondicherry, ...		16	... ...	Combaoo Sumba is the finest: all excellent specimens and accompanied by a lucid Report.	
		525			

TABLE No. 5.

Showing the number of Specimens of Rice grown in the different Districts, named below.

Where grown.		No. of Samples.	Names of Contributors.	Remarks by the Sub-Committee.	Confirmation or otherwise with remarks by the General Committee.
Hyderabad, ...	Rice.	34	Captain Taylor. ...		
Coimbatore, ...		1	Kistniah. ...	Ordinary Rice.	
Madras, ...		11	Ramasawmy Chetty.	Do.	
Travancore, ...		12	Local Committee ...	Ordinary quality.	
Cuddapah, ...		6	M. Murray, Esq....	5 ordinary, and one Telakarh zooloo best.	
America, ...		1	Madras C. of Commerce.	So damaged not easy to give a judgment.	
Tanjore,		90	Hurry Row, ...	19 Bottles and 71 Bags. In bottles Seeraga Sumba best. In Bags Saday Sumba best. As a whole very superior.	
Mangalore, ...		12	Pedro Proboo. ...	Jeerah best.	
Bellary, ...		2	... ...	No. 1511 best (very fine.)	
Kurnool, ...		5	... ...	Ordinary Rice.	
Salem, ...		1	... ...	Said to be the finest in the collection as a single specimen.	
Vizianagrum, ...		1	... ...	Superfine quality.	
		174			

TABLE No. 6.

Showing separately the number of samples of each variety of grain or pulse received from the several Districts named below. This Table differs from No. 7, inasmuch as that shows only the total number of every description of grains and pulses received from any locality—this shows, under one head, how many samples of that kind were received from each locality.

Where grown.		No. of Samples.	Names of Contributors.	Remarks by the Sub Committee.	Confirmation or otherwise with remarks by the General Committee.
Bellary, ...	Wheat	2	Local Committee ...	One of these is of excellent quality the other inferior.	
Coimbatore, ...		1	Kistniah	Of good quality	
Hyderabad, ...		1 & 10	Capt. Taylor... ...	Of various qualities.	
Bangalore and Bengal, ...		2	Ramasawmy Chetty.	Of apparently average quality.	
Masulipatam,... ...		1	Local Committee ...	Of fine quality.	
Cuddapah,... ...		2	M. Murray, Esq. ...	Of average quality.	
Shevaroy Hills,... ...		1	Chinniah Moodely...	Do.	

TABLE No. 6.—*Continued.*

Where grown.	No. of Samples.	Names of Contributors.	Remarks by the Sub Committee.	Confirmation or otherwise with remarks by the General Committee.
Kurnool,... ...	2	... ...	Of fair quality.	
Bangalore,... ...	1	... ...	Of average quality.	
Travancore,... ...	1	General Cullen ...	Do.	
	24			
Bellary	1	Local Committee ...	Of average quality	
Coimbatore... ...	1	Kistniah... ...	Do.	
Hyderabad... ...	6	Capt. Taylor ...	Of various qualities	
Madras... ...	1	Ramasawmy Chetty,	Of ordinary quality	
Masulipatam... ...	2	Local Committee ...	Of fair quality	
Poodoocottah... ...	1	... ...	Of average quality	
Tinnevelly... ...	1	... ...	Of good quality	
Tanjore... ...	6	Hurry Row ...	Yellow, white, and black; one American, very fine	
Pegu. ... [Maize]	1	Dr. Brandis ...	Average quality	
Vizianagrum ...	2	Rajah of Vizanagram	Of fair quality	
Cuddapah... ...	1	... ...	Do.	
Hyderabad... ...	1	... ...	Of ordinary quality	
Kurnool... ...	1	... ...	Do	
Pondicherry... ...	1	Local Committee ...	Of average quality	
Chingleput... ...	2	Runga charloo ...	Do.	
Madras... ...	1	Major Maitland ...	The finest specimen in the collection	
	29			
Neilgherries [Barley]	1	Mr. McIvor. ...	A good specimen	
	1			
Bellary, ...	3	Local Committee, ..	Fair quality	
Chingleput, ...	6	Differentcontributors	5 of different qualities, and one very fine specimen	
Coimbatore, ...	1	Kistniah, ...	Ordinary sample	
Hyderabad,... ...	18	Capt. T. ...	Various qualities	
Madras, ...	1	Mr. Haydon, ...	One sample with 9 spikelets springing from one axis	
Masulipatam,	3	Local Committee, ...	Good	
Vizianagrum,...	1	Rajah of Vizanagrum	Ordinary quality	
Tanjore ...	2	Hurry Row, ...	Good quality.	
Madras, ... [Great Millet-Cholum]	1	Ramasawmy Chetty,	Ordinary quality.	
Cuddapah,...	2	M. Murray, Esq. ...	Fine quality	
Hyderabad, ...	3	Capt. T. ...	Ordinary quality	
Kurnool, ...	2	... ...	Do.	
Mangalore, ...	2	Pedro Proboo, ...	Fair quality	
Hyderabad,... ...	4	Capt. T ...	Various qualities	
Pondicherry, ...	4	P. Appavoo Moodly,	Do.	
Bangalore, ...	2	... ...	Ordinary quality	

TABLE No. 6.—*Continued.*

Where grown.		No. of Samples.	Names of Contributors.	Remarks by the Sub Committee.	Confirmation or otherwise with remarks by the General Committee.
Travancore, ...		1	Local Committee, ...	Ordinary quality	
		56			
Poodoocottah,		1	Rajah Tondiman, ...	Fair quality	
Tinnevelly, ...	Black-Cholum.	1	Mera Soobooroyen,	Do.	
Pondicherry,		1	M. Pereotet, ...	Good quality	
		3			
Bellary, ...		1	Local Committee, ...	Ordinary quality	
Chingleput, ...		3	Differentcontributors	Fair quality	
Coimbatore, ...		1	Kistniah, ...	Ordinary quality	
Poodoocottah,		1	Rajah Tondiman, ...	Fair quality	
Tanjore, ...		2	Hurry Row, ...	Good quality	
Pondicherry,		1	Appavoo Moodly,...	Inferior quality	
Hyderabad, ...	Italian Millet.	3	Capt. T. ...	Various qualities	
Cuddapah, ...		1	M. Murray Esq., ...	Fair quality	
Mangalore, ...		4	Pedro Praboo, ...	Fair quality	
Kurnool, ...		1	... ...	Ordinary quality	
Bangalore, ...		1	... ...	Do.	
Madras, ...		1	Ramasawmy Chetty,	Do.	
Travancore, ...		1	Local Committee, ...	Fair quality	
		21			
Chingleput, ...		2	Differentcontributors	Different qualities	
Coimbatore, ...		4	Kistnaiah, ...	Fair quality	
Hyderabad, ...		4	... ...	Different quality	
Tinevelly, ...		1	Mera Soobooraуen,	Fair quality	
Malabar,... ...		1	Mr. Bassan, ...	Do.	
Tanjore, ...		3	Hurry Row, ...	Do.	
Vizianagrum,...	Sawman.	1	... ...	Ordinary quality	
Bangalore,...		2 & 1	Kistasawmy, ...	Do.	
Poodoocottah, ...		2	TondimanRajah, ...	Do.	
Mangalore,... ...		2	Pedro Proboo, ...	Do.	
Pondicherry, ...		1	Appavoo Moodly,...	Average quality	
Hyderabad,... ...		1	... ...	Inferior quality	
		25			
Pondicherry, ...		1	Local Committee, ...	Fair specimen	
Tanjore, ...		2	Hurry Row, ...	Good specimens	
Cuddapah, ...		2	M. Murray, Esq, ...	Good specimens	
Masulipatam,	Cadaycanny.	1	Local Committee,...	Ordinary specimen	
Travancore, ...		1	... ...	Do.	
Hyderabad,...		1	Capt. Taylor, ...	Do.	
		8			

TABLE No. 6.—*Continued.*

Where grown.		No. of Samples.	Names of Contributors.	Remarks by the Sub Committee.	Confirmation or otherwise with remarks by the General Committee.
Hyderabad, ...	Pill Arisee.	5	... ...	Different qualities	
Tanjore, ...	Pill Arisee.	3	Hurry Row, ...	Fair quality	
Vizianagrum, ...	Pill Arisee.	3	... ...	Do.	
Poodoocottah,	Pill Arisee.	1	Cooderay Valay, ...	Good quality	
Chingleput, ...	Pill Arisee.	1	Moothen, ...	Do.	
		13			
Chingleput ...		4	Ranga Charloo ...	Different qualities	
Do. ...		1	Ramakistna ...	Fair quality	
Do. ...		1	Sooba Iyer ...	Average quality	
Do. ...		1	Veerasawmy ...	Do.	
Bellary, ...		1	Local Committee ...	Do.	
Coimbatore, ...		1	Kistniah ...	Ordinary quality	
Do. ...		1	Do.	Do.	
Hyderabad, ...		3	.. ..	Various qualities	
Do. ...		4	... ...	Do.	
Do. ...		1	Captain Taylor ...	Fair quality	
Unknown,	Varagoo	1	... ...	Inferior quality	
Madras,	Varagoo	1	Ramasawmy Chitty	Average quality	
Tinnevelly,	Varagoo	1	Soobooraye n, ...	Do.	
Pondicherry,	Varagoo	1	Local Committee, ...	Good quality	
Do. ...		1	Do. ...	Do.	
Cuddapah, ...		1	... ...	Fair quality	
Do. ...		1	... ...	Do.	
Kurnool, ...		1	... ...	Ordinary quality	
Poodoocottah, ...		1	Ramachundra, Tondiman Bahadoor, ...	Do.	
Tanjore, ...		2	Hurry Row, ...	Good quality	
Travancore. ...		1	Local Committee ...	Do.	
		30			
Bellary, ...		1	Local Committee ...	Fair quality	
Chingleput, ...		1	... ...	Do.	
Do. ...		1	... ...	Average quality	
Do. ...		4	Runga Charloo ..	Do.	
Coimbatore,	Ragy	1	Kistniah ...	Fair quality	
Hyderabad,	Ragy	3	... ...	Different qualities	
Do.	Ragy	1	... ...	Average quality	
Madras, ...		1	Ramasawmy Chetty.	Ordinary quality	
Masulipatam, ...		1	Local Committee ...	Do.	
Tinnevelly, ...		1	Nullaseven ...	Ordinary quality	
Pondicherry, ...		1	Local Committee ...	Good quality	
Do. ...		1	Do.	Fair quality	
Do. ...		1	Do.	Do.	
Bangalore, ...		1	Kistnasawmy ...	Good quality	
Cuddapah,	Ragy continued.	1	M. Murray Esq. ...	Do.	
Do.	Ragy continued.	1	Do.	Do.	
Kurnool,	Ragy continued.	1	Do.	Do.	
Poodoocottah,	Ragy continued.	1	Ramachundra ...	Fair quality	

TABLE No. 6.—*Continued.*

Where grown.		No. of Samples.	Names of Contributors.	Remarks by the Sub-Committee.	Confirmation or otherwise, with remarks by the General Committee.
Tanjore,	Ragy	1	Hurry Row ...	Good quality.	
Vizianagrum,		1	... ...	Average quality.	
Mangalore,		1	Pedro Proboo ...	Fair quality.	
Travancore,		1		Ordinary quality.	
		28			
Bellary,	Spiked Milled Cumboo	1	Local Committee ..	Fair quality.	
Chingleput,		1	Coopoosawmy ...	Good quality.	
Do.		1	Vurdacherry ...	Average quality.	
Do.		1	Runga charloo ...	Do.	
Do,		1	Paupah Reddy ..	Do.	
Coimbatore		1	Kistniah ...	Good quality.	
Hydrabad		4	... ...	Different qualities.	
Madras		1	Ramasawmy Chetty	Fair quality.	
Masulipatam		1	Local Committee ...	Ordinanry quality.	
Do,		1	Do. ...	Average quality.	
Tinnevelly		1	Meery Soobboorayen	Fair quality.	
Cuddapah		1	Vengal Reddy ...	Do.	
Do.		1	... ...	Ordinary quality.	
Poodoocottah		1	... ...	Do.	
Kurnool,		1	... ...	Do.	
Hyderabad,		1	Captain Taylor ...	Average quality.	
Vizianagrum,		1		Do.	
Travancore,		1	Local Committee ...	Fair quailty.	
Tanjore, ...		1	Hurry Row, ...	Good quality.	
Do. ...		1	Do. ...	Do.	
Do. ...		1	Do. ...	Fair quality.	
Pondicherry, ...		1	Appoo Moodelly, ...	Good quality.	
Bangalore, ...		1		Do.	
		26			
Hyderabad, ...	Bamboo Rice.	1	... ...	Fair quality.	
Masulipatam ...		1	Seetia Naidoo, ...	Average quality.	
Chingleput, ...		1	Runga Charloo, ...	Ordinary quality.	
		3			
Chittoor, ...	Grass Corn.	1	Miss Pereira ...	Fair quality.	
		1			
Chingleput,	Bullur.	1	Rungacharloo, ...	Ordinary quality.	
Do.		1	... ...	Average quality.	
Bellary,		1	Local Committee,...	Fair quality.	
Hyderabad,		6	... ...	Different quality.	
Cuddapah,		1	M. Murray, Esq. ..	Fair quality.	

TABLE No. 6.—*Continued.*

Where grown.		No. of Samples.	Names of Contributors.	Remarks by the Sub-Committee.	Confirmation or otherwise, with remarks by the General Committee.
Travaucore,	Bullur, continued.	1	Local Committee,...	Do.	
Tinnevelly,		1	SoodalamootooPilly,	Average quality.	
Bangalore,		1	... ...		
Do.		1	... ...		
Do. ...		1	... ...		
Kurnool, ...		1	... ...	Ordinary quality.	
Pegu, ...		1	Dr. Brandis, ...	Very good specimen.	
Tanjore,		1	Hurry Row, ...	Good specimen.	
Madras,		1	Ramasawmy Chetty,	Ordinary quality.	
Coimbatore,		1	Kistniah, ...	Do.	
		20			
Pondicherry,	Caramany.	1	Local Committee,...	Good quality.	
Do.		2	Do.	Do.	
Vizianagrum,		1	... ...	Fair quality.	
Do.		1	... ...	Do.	
Chingleput,		1	Runga Charloo, ...	Average quality.	
Do.		1	Davanum, ...	Do.	
Do.		1	Do. ...	Do.	
Do.		1	Runga Charloo, ...	Ordinary quality.	
Tanjore,		4	Hurry Row, ...	Good quality.	
Cuddapah,		1	M. Murray, Esq. ...	Do.	
Do.		1	... ...	Do.	
Tinnevelly,		1	... ...	Fair quality.	
Bellary, ...		1	Local Committee,...	Do.	
Kurnool, ...		1	... ...	Do.	
Masulipatam,....		2	Local Committee,...	Average quality.	
Hyderabad, ...		1	... ...	Ordinary quality.	
Bangalore, ...		1	... ...	Average quality.	
Pegu.		3	Dr. Brandis, ...	Fair quality.	
Madras,		1	Ramasawmy, ...	Do.	
Coimbatore,		1	Kistniah, ...	Ordinary quality.	
Bellary,		1	Local Committee,...	Average quality.	
Vizianagrum,		1	... ...		
		29			
Pondicherry, ...	Dholl.	1	Local Committee,...	Good quality.	
Tanjore, ...		2	Hurry Row, ...	Do.	
Cuddapah, ...		1	... ...		
Do. ...		2	M. Murray, Esq. ...	Fair quality.	
Chingleput, ...		1	Runga Charloo, ...	Ordinary quality.	
Do. ...		1	Ramanada, ...	Do.	
Vizianagrum, ...		1	... ...	Fair quality.	
Bellary,... ...		1	Local Committee,...	Good quality.	
Do. ...		1	Do. ...	Do.	
Coimbatore, ...		1	Kistniah, ...	Average quality.	
Hydrabad, ...		13	... ...	Do.	
Travancore, ...		1	Local Committee,...	Do.	

TABLE No. 6.—*Continued.*

Where grown.		No. of Samples.	Names of Contributors.	Remarks by the Sub-Committee.	Confirmation or otherwise with remarks by the General Committee.
Masulipatam,...	Dholl, continued.	1	Do.	Fair quality.	
Do.		1	Do.	Do.	
Do.		1	... ...	Do.	
Bangalore, ...		2	... ...	Ordinary quality.	
Kurnool, ...		1	... ...	Do.	
Madras, ...		2	... ...	Do.	
Do.		1	Ramasawmy, ...	Do.	
		35			
Bellary, ...	Oolundoo or Mash.	1	Local Committee,...	Fair quality.	
Chingleput, ...		1	Davanum, ...	Average quality.	
Do. ...		1	Runga Charloo, ..	Fair quality.	
Coimbatore, ...		1	Kistniah, ...	Ordinary quality.	
Pondicherry, ...		1	Appoo Moodelly, ...	Good quality.	
Bangalore, ...		1	... ...	Average quality.	
Tinnevelly, ...		1	... ...	Fair quality.	
Cuddapah, ...		2	... ...	Do.	
Tanjore, ...		1	Hurry Row, ...	Good quality.	
Vizianagrum,...		1	... ...	Fair quality.	
Kurnool, ...		1	... ...	Ordinary quality.	
Hyderabad, ...		1	... ...	Do.	
Madras ...		1	Ramasawmy, ...	Do.	
Masulipatam,...		1	Local Committee,...	Fair quality.	
Travancore, ...		1	Do.	Average quality.	
		16			
Bellary, ...	Green Gram or Moong.	1	Local Committee,...	Fair quality.	
Chingleput, ...		2	... ...	Average quality.	
Do. ...		1	Runga Charloo, ...	Fair quality.	
Hyderabad, ...		8	... ...	Different qualities.	
Do. ...		2	Captain Taylor, ...	Fair quality.	
Madras, ...		1	Ramasawmy Chetty,	Do.	
Masulipatam,...		2	Local Committee,...	Good quality.	
Tinnevelly, ...		1	... ...	Ordinary quality.	
Cuddapah, ...		1	... ...	Do.	
Vizianagrum,...		3	... ...	Various qualities.	
Pondicherry, ...		4	Local Committee,...	Good qualities.	
Bangalore, ...		2	... ...	Fair qualities.	
Tanjore, ...		2	Hurry Row, ...	Good qualities.	
Coimbatore, ...		1	Kistniah, ...	Ordinary quality.	
Pegu, ...		1	Dr. Brandis, ...	Good quality.	
Travancore, ...		1	Local Committee,...	Average quality.	
		33			
Bellary,	Mussoor,	1	Local Committee,...	Good quality.	
Hyderabad,		1	Captain Taylor, ...	Do.	
		2			

TABLE No. 6.—*Continued.*

Where grown.		No. of Samples.	Names of Cultivators.	Remarks by the Sub-Committee.	Confirmation or otherwise, with remarks by the General Committee.
Masulipatam, ...	Peas.	1	Local Committee....	Fair quality.	
Pondicherry, ..		1	Do.	Superior quality.	
Madras, ...		1	Ramasawmy ...	Average quality.	
Coimbatore, ...		1	Local Committee,...	Good quaility.	
Hyderabad, ...		1	Capt. Taylor, ...	Do.	
Vizianagrum, ...		1	... ...	Fair quality.	
Tanjore, ...		1	Hurry Row, ...	Good quality.	
		7			
Bellary, ...	Coolthi Gram.	1	Local Committee...	Good quality.	
Chingleput, ...		1	Davanun, ...	Average quality.	
Do. ...		1	Runga charloo, ...	Do.	
Coimbatore, ...		1	Kistniah, ...	Do.	
Hyderabad, ...		10	... ...	Different qualities.	
Do. ...		1	Capt. Taylor ...	Fair quality.	
Madras, ...		1	Ramasawmy Chetty.	Average quality.	
Masulipatam, ...		1	Local Committee,...	Fair quality.	
Tinnevelly, ...		1	Mera Soobooroyen,.	Average quality.	
Pondicherry, ...		1	Local Committee,...	Good quality.	
Bangalore, ...		1	... ...	Fair quality.	
Cuddapah, ...		2	M. Murray, Esq. ...	Good quality.	
Tanjore, ...		1	Hurry Row, ...	Do.	
Travancore, ...		1	... ...	Average quality.	
		24			
Pondicherry, ...	Kattu Kolloo.	1	Local Committee,...	Good quality.	
Bangalore, ...		1	... ...	Average quality.	
Kurnool, ...		1	... ...	Do.	
Chingleput, ...		1	... ...	Do.	
Hyderabad, ..		8	... ...	Do.	
Masulipatam, ...		1	Local Committee....	Fair quality,	
Tinnevelly, ...		1	Nullaseven, ...	Average quality.	
Vizagapatam,...		1	... ...	Do.	
		15			
Bellary, ...	Bengal Gram.	1	Local Committee,...	Good quality.	
Chingleput, ...		1	Davanun, ...	Average quality.	
Coimbatore, ...		1	Kistniah, ...	Do.	
Hyderabad, ...		15	... ...	Different qualities.	
Madras, ...		1	Ramasawmy Chetty.	Average quality,	
Masulipatam,...		1	Local Committee,...	Fair quality.	
Tinnevelly, ...		1	Meera Soobooroyen,	Average quality.	
Tanjore, ...		1	Hurry Row. ...	Good quality.	
Travancore, ...		1	Local Committee,...	Do.	
Pondicherry, ...		1	Do.	Do.	
Bangalore, ...		2	... ...	Do.	
Pegu, ...		1	Dr. Brandis, ...	Do.	

TABLE No. 6.—*Continued.*

Where grown.		No. of Samples.	Names of Contributors.	Remarks by the Sub Committee.	Confirmation or otherwise, with remarks by the General Committee.
Vizianagrum, ...		1	... ...	Average quality.	
Cuddapah, ...		2	... ...	Various qualities.	
		30			
Hydrabad, ...	Variety.	1	Captain Taylor, ...		
		1			
Hydrabad, ...	Beans.	1	... ...	Average quality.	
Do. ...	Beans.	1	Dr. Riddell, ...	Fair quality.	
Ootacamund, ...	Beans.	4	Mr. McIvor, ...	Very good quality.	
Kurnool, ...	Beans.	1	... ...	Average quality.	
		7			
Hydrabad, ...	Raj-jeeva.	2	... ...		
Mangalore, ...	Raj-jeeva.	1	Pedro Proboo, ...		
		3			
Chingleput, ...	Coffee.	1	Mr. Brass, ...	Ordinary specimen.	
Hydrabad, ...	Coffee.	1	... ...		
Do. ...	Coffee.	1	Dr. Riddell, ...	Fair Sample,	
Tinnevelly, ...	Coffee.	1	T. VasoodavooPillay	Bags down below.	
Do. ...	Coffee.	1	Do. ...		
Malabar, ...	Coffee.	2	Mr. Bassano, ...	Ordinary.	
Travancore, ...	Coffee.	1	General Cullen, ...	Fair samples.	
Do. ...	Coffee.	1	Do. ...		
Do. ...	Coffee.	1	Local Committee,...		
Mysore, ...	Coffee.	2	Mr. Cannon, ...		
Cuddapah, ...	Coffee.	1	... ...		
Malabar, ...	Coffee.	1	Cary Bapoo, ...	Two boxes.	
Madras, ...	Coffee.	8	Cham. of Commerce		
Do. ...	Coffee.	3	Messrs. Binny & Co.	Pea and large.	
Vizianagrum,...	Coffee.	1	H. H. the Rajah, ...		
Salem,	Coffee.	1	Messrs. Richardson, and Co. ...	12 Shavoroy Hills 5069 Alkban.	
Do. ...	Coffee.	2	Messrs. Fischer & Co.	Pea Berry, 1st quality.	
Mangalore, ...	Coffee.	1	Pedro Proboo. ...	Pea Berry, 2nd quality.	
Madras, ...	Coffee.	1	Madame Thane, ...		
		31			
Pegu, ...	Burmese Tea.	1	Dr. Brandis, ...	Not found.	
Madras, ...	Cocoa.	1	Messrs. Binny & Co.	Very interesting specimen.	

TABLE No. 6.—*Continued.*

Where grown.		No. of Samples.	Name of Contributors.	Remarks by the Sub Committee.	Confirmation or otherwise, with remarks by the General Committee.
Chingleput, ...	Tobacco.	1	... ...		
Coimbatore, ...		1	Kistniah	Do.	
Masulipatam,		1	Local Committee	Do.	
Pegu, ...		1	Dr. Brandis	Inferior.	
Do.		1	Do.	Do.	
Rajahmundry, ...		2	Chagoody Ramasamy	Very good quality.	
Moulmein, ...		1	Capt. Benson... ...	Inferior.	
Madura, ...		1	Collector	Do.	
Tanjore, ..		1	Hurry Row	Three qualities all good, by far the best samples of Tabacco.	
Do. ...		1	Do.		
Hydrabad, ...		1	... ...	Inferior.	
Nameless, ...		1	... ...	Do.	
Vizianagarum,...		1	... ...	Do.	
		14			
Pondicherry, ...	Ganja	1	Local Committee ...	Good quality.	
Do, ...		1	Do. ...	Do.	
		2			
Hydrabad, ...	Wine & Spirits.	1	Ramasawmy Moody.		
Do. ...		1	Do, ...		
Do, ...		1	Do. ...		
Do. ...		1	Do. ...		
Rajahmundry, . .		1	Mr. C. Rundall ...		
Pondicherry, ...		1	Mr. Godfray		
		6			
Pegu, ...	Refreshing drinks	1	Dr. Brandis	Not requiring much notice.	
Mangalore, ...		6	Pedre Proboo ...		
		7			
Mysore, ...	Vinegar	1	Wrightman	Fair samples.	
Rajahmundry,		1	Mr. C. Rundall ...		
Mangalore, ...		1	Pedre Proboo ...		
		3			
Madras, ...	Nutmeg & Mace.	1	Messrs. Binny & Co.	Very fine (best) mace.	
Travancore, ...		2	General Cullen ...	Cloves and Nutmegs best.	
Tinnevelly, ...		1	... ...	Second best.	
Madura, ...		1	... ...		
Nellore, ...		1	... ...		
Malabar, ...		2	Cottyam Tahsildar...	Inferior.	
Ceylon, Royal Botanical Gardens Paradenia,		1	Mr. Thwaites ...		

TABLE No. 6.—*Continued.*

Where grown.		No. of Samples.	Name of Contributors.	Remarks by the Sub Committee.	Confirmation or otherwise, with remarks by the General Committee.
Madras		1	Ramasawmy Chetty.		
		10			
Hyderabad, ...	Cinnamon.	1	Captain Taylor, ...		
Malabar, ...		1	Cottyam Tahsildar,		
North Malabar,		1	Mr. Brown, ...		
Travancore, ...		1	Local Committee,		
Madras, ...		1	Messrs. Binny & Co.	Very fine.	
Mangalore, ...		1	Pedre Proboo, ...		
		6			
Malabar, ...	Cassia Bark.	1	Cottyam Tahsildar,	Good quality.	
Travancore, ...		1	Local Committee,...	Do.	
		2			
Malabar, ...	Cassia Buds.	1	Cottyam Tahsildar,	Fair.	
		1			
Madras,	Cloves.	1	Ramasawmy Chetty,		
Travancore,		1	Genl. Cullen, ...	The finest.	
Do.		1	Local Committee,...		
Do.		1	Messrs. Binny & Co.		
Ceylon Botanical,		1			
Garden Paradenia,		1	Mr. Thwaites, ...		
Nellore, ...		1			
Madura,		1	H. Young, Esq. ...		
Malabar,		1	Cottyam Tahsildar,..		
		8			
Coimbatore,	Cardamoms.	1	Kistniah, ...	Common.	
Madras,		1	Ramasawmy Chetty,		
Malabar, ...		2	Mr. Bassano, ...		
Do. ...		1	Cottyam Tahsildar,		
Travancore, ...		1	Local Committee,...		
Madras, ...		3	Chamb. of commerce		
Nellore, ...		1	H. Young, Esq. ...		
Bangalore, ...		1	... ...		
Madura, ...		1	... ...		
Hyderabad, ...		1	... ...		
Ceylon Royal Botanical Gardens Paradenia,		1	Mr. Thwaites, ...	Peculiarly rare specimen.	
		14			

TABLE No. 6.—*Continued.*

Where grown.		No. of Samples.	Names of Contributors.	Remarks by the Sub Committee.	Confirmation or otherwise, with remarks by the General Committee.
Bellary,	Coriander.	1	Local Committee, ..	Average quality.	
Coimbatore, ...		1	Kistniah, ...	Do.	
Hydrabad, ...		1	....	Do.	
Do.		1	Captain Taylor, ...	Do.	
Madras, ...		1	Ramsawmy Chetty,	Do.	
Masulipatam,...		1	Local Committee,...	2nd Best.	
Travancore, ...		1	Do.	Ordinary quality.	
Kurnool, ...		1	....	Do.	
Nellore, ...		1	H. Young, Esq, ...	Do.	
Pondicherry, ...		1	Local Committee,...	Do.	
Madura, ...		1	....	Do.	
Cuddapah, ...		1	....	Do.	
Tanjore,... ...		1	Hurry Row, ...	Best quality.	
Vizianagrum,...		1	....	Do.	
		14			
Bellary, ...	Chillies.	1	Local Committee....	Best quality.	
Chingleput, ...		1	Pateheappa, ...	Do.	
Coimbatore, ...		1	Kistniah, ...	Ordinary quality.	
Hydrabad, ...		1	Captain Taylor, ...	Do.	
Pegu, ...		1	Dr. Brandis,.........	Do.	
Travancore, ...		3	Local Committee,...	Different qualities.	
Vizianagrum, ...		1	....		
		9			
Hydrabad, ...	Pepper, Black.	1	....	Average quality.	
Do. ...		1	Capt. Meadows, ...	Do.	
Malabar, ...		1	Cottyam Tahsildar...	Best quality.	
Madras, ...		1	Ramasawmy Chetty	Average quality.	
Travancore, ...		1	Local Committee..	Good quality.	
Do. ...		1	Messrs. Binny & Co.	Do.	
Nellore, ...		1	....	Average quality.	
Pondicherry, ...		1	Local Committee ...	Good quality	
Vizianagarum,..		1	....	Average quality.	
Madura,... ...		1	....	Do.	
Bangalore, ...		1	....	Do.	
Coimbatore, ...		1	....	Fair quality.	
		12			
Travancore, ...	Pepper, White.	1	Local Committee,...	Good quality.	
Do. ...		1	Messrs. Binny & Co.	Do.	
Bangalore, ...		1	....	Average quality.	
Mangalore, ...		1	Pedre Proboo... ...	Fair quality.	
Malabar, ...		1	Cottyam Tahsildar...	Do.	
		5			

TABLE No. 6.—*Continued.*

Where grown.		No. of Samples.	Names of Contributors.	Remarks by the Sub Committee.	Confirmation or otherwise, with remarks by the General Committee.
Bangalore, ...	Pepper white continued.	1	....	Average quality.	
Mangalore, ...	Pepper white continued.	1	Pedre Proboo, ...	Fair quality.	
Malabar, ...	Pepper white continued.	1	Cottyam Tahsildar,	Do.	
		5			
Bellary, ...	Betel leaf.	1	Local Committee,...		
		1			
Bellary, ...	Betel Nut.	1	Local Committee,...	Average quality.	
Hyderabad, ...	Betel Nut.	1	....	Do.	
Do. ...	Betel Nut.	1	....	Do.	
Pegu, ...	Betel Nut.	1	Dr. Brandis, ...	Fine quality.	
Moulmein, ...	Betel Nut.	1	....	Do.	
Salem, ...	Betel Nut.	1	Tondroy Naick, ...	Do.	
Do. ...	Betel Nut.	1	Chokalinga Moodly.	Do.	
Do. ...	Betel Nut.	1	Heeray Gowden, ...	Do.	
Travancore, ...	Betel Nut.	4	Local Committee,...	Good quality.	
Madras, ...	Betel Nut.	1	Messrs. Binny & Co.	Do.	
Do. ...	Betel Nut.	1	....	Fair quality.	
Bangalore, ...	Betel Nut.	4	....	Different qualities.	
Do. ...	Betel Nut.	1	....	Fair quality.	
Tanjore, ...	Betel Nut.	1	Hurry Row, ...	Good quality.	
Mangalore, ...	Betel Nut.	1	Pedre Proboo, ...	Best quality.	
Pondicherry, ...	Betel Nut.	1	Local Committee....	Good quality.	
		22			
Bellary, ...	Ginger.	1	Local Committee,...	Average quality.	
Hyderabad, ...	Ginger.	1	....	Best quality.	
Madras, ...	Ginger.	1	Ramasawmy Chetty,		
Rangoon, ...	Ginger.	1	Dr. Brandis, ...	Very fine.	
Travancore, ...	Ginger.	1	Local Committee,...	Good quality.	
Vizianagram, ...	Ginger.	1	....	Average quality.	
Pondicherry, ...	Ginger.	1	Local Committee,...	Second best.	
Madura, ...	Ginger.	1	....	Average quality.	
Nellore, ...	Ginger.	1	....	Do.	
		9			
Malabar ...	Turmeric.	1	....	Fair quality.	
Madras ...	Turmeric.	1	Ramasawmy Chetty,	Average quality.	
Do.	Turmeric.	1	Do.	Do.	
		3			
Bellary, ...	Fenugreek.	2	Local Committee,...	Average quality.	
Coimbatore, ...	Fenugreek.	1	Kistniah, ...	Do.	

TABLE No. 6.—*Continued.*

Where grown.		No. of Samples.	Names of Contributors.	Remarks by the Sub-Committee.	Confirmation or otherwise, with remarks by the General Committee.
Hyderabad, ...	Fenugreek, continued.	1	Capt. Taylor, ...	Average quality	
Madras, ...		1	Ramasawmy Chetty.	Do.	
Cuddapah, ...		1	....	Do.	
Kurnool, ...		1	....	Do.	
Tanjore, ...		1	Hurry Row. ...	Do.	
Madura ...		1	....	Do.	
Pondicherry, ...		1	Local Committee,...	Do.	
Vizianagrum, ...		1	... ...	Do.	
Travancore, ...		1	Local Committee,...	Do.	
		12			
Pegu, ...	Cummin.	1	Dr. Brandis, ...	Average quality.	
Coimbatore, ...		1	Kistniah, ...	Do.	
Bellary, ...		1	Local Committee,...	Best quality.	
Pondicherry, ...		1	Do.	Fair quality.	
Hyderabad, ..		1	Capt. Taylor ...	Ordinary quality.	
Cuddapah, ...		1	... ...	Average quality.	
Nellore, ...		1	H. Young, Esq, ...	Fair quality.	
Kurnool, ...		1	... ...	Do.	
Bangalore, ...		1	Kistnasawmy, ...	Ordinary quality.	
Madras, ...		1	Ramasawmy Chetty.	Do.	
		10			
Pondicherry, ...	Aniseed.	1	Local Committee,...	Good quality.	
Hyderabad, ...		1	Capt. Taylor, ...	Best quality.	
Bellary, ...		1	Local Committee,...	Average quality.	
Kurnool, ...		1	....	Ordinary quality.	
Nellore, ...		1	H. Young, Esq, ...	Fair quality.	
Pegu, ...		1	Dr. Brandis, ...	Good quality.	
Madras, ...		1	Ramasawmy Chetty,	Average quality.	
		7			
Pondicherry, ...	Sadacouppee.	1	....	Good quality.	
Nellore, ...		1	Local Committee,...	Fair quality.	
Hyderabad, ..		1	H. Young, Esq, ...	Do.	
Bellary, ...		1	Capt. Taylor, ...	Ordinary quality.	
		4			

TABLE No. 6.—*Continued.*

Where grown.		No. of Samples.	Names of Contributors.	Remarks by the Sub-Committee.	Confirmation or otherwise, with remarks by the General Committee.
Pegu, ...	Kala-jeera.	1	Dr. Brandis, ...	Good quality.	
Pondicherry, ...		1	Local Committee, ..	Best quality.	
		2			
Kurnool, ...	Omum.	1	....	Average quality.	
Hydrabad, ...		1	Captain Taylor, ...	Fair quality.	
Bellary, ...		1	Local Committee, ...	Best quality.	
Do. ...		1	....	Fair quality.	
Pondicherry, ...		1	Local Committee, ...	Good quality.	
Madras, ...		1	Ramasawmy Chetty,	Do.	
Vizianagrum, ...		1	....		
		7			
Tanjore, ...	Cleome viscosa.	1	Hurry Row, ...		
Vizianagarum...		1	....		
		2			
Madras, ...	Cara-way.	1	....	Best quality.	
		1			
Bellary, ...	Must-ard.	1	Local Committee, ...	Good quality.	
Coimbatore, ...		1	Kistniah, ...	Do.	
		2			
Coimbatore, ...	Tamar-ind.	1	Kistniah, ...	Ordinary quality.	
		1			
Hydrabad, ...	Garlic and Onion.	1	Captain Taylor, ...	Best quality.	
Travancore, ...		1	Local Committee, ...	Average quality. (Garlic.)	
Vizianagarum ...		1	....	Do.	
Madura, ...		2	....	Do.	
Bellary, ...		1	Kumply Tahsildar, ...	Best quality. (Onion.)	
Cuddapah, ...		1	....	Ordinary quality.	
		7			
Ceylon, Botanical Gardens, Peredenia, ...	Vanilla.	1	Mr. Thwaites, ...	Very good quality.	
		1			

TABLE No. 6.—*Continued.*

Where grown.		No. of Samples.	Names of Contributors.	Remarks by the Sub Committee.	Confirmation or otherwise, with remarks by the General Committee.
Pondicherry, ...	East Indian Arrowroot.	1	Mr. T. Filatrian, ...		
Do. ...	East Indian Arrowroot.	1	Mr. L. Peltier, ...		
Rajahmundry,...	East Indian Arrowroot.	1	Mr. Charles Rundall,		
Do.	East Indian Arrowroot.	1	Do. ...		
		4			
Hydrabad, ...	W. I. Arrowroot.	1	....		
Russelcondah...	W. I. Arrowroot.	1	Capt. L. Johnston, 26th Regt. N. I.		
		2			
Travancore, ...	Arrowroot and Tapioca.	4	Local Committee....		
Vizianagrum ...	Arrowroot and Tapioca.	1	H. H. the Rajah, ...	Inferior.	
Mangalore, ...	Arrowroot and Tapioca.	3	Pedre Proboo, ...		
Tranquebar, ...	Arrowroot and Tapioca.	1	H. Nott, Esq., Civil Surgeon, ...		
Hydrabad, ...	Arrowroot and Tapioca.	1	Dr. Smith, ...		
Do. ...	Arrowroot and Tapioca.	1	Kunniah, ...		
Do. ...	Arrowroot and Tapioca.	1	Local Committee,...		
Do. ...	Arrowroot and Tapioca.	1	Dr. Smith, ...		
Madura, ...	Arrowroot and Tapioca.	1	Frances Ashbury,...	Inferior.	
Do. ...	Arrowroot and Tapioca.	1	Rev. R. Sittle, ...		
Tanjore, ...	Arrowroot and Tapioca.	1	Hurry Row, ...		
Do. ...	Arrowroot and Tapioca.	1	Mr. Kohlhoff, ...		
Mysore, ...	Arrowroot and Tapioca.	1	Major Coats,... ...		
Guntoor, ...	Arrowroot and Tapioca.	1	....		
Tinnevelly, ...	Arrowroot and Tapioca.	1	Coopchund, ...		
Malabar, ...	Arrowroot and Tapioca.	1	Tellicherry Bary Bapoo, ...		
		21			
	Talipot Palm.	1	Paraka Coroovelloo,.		
	Talipot Palm.	3	Mrs. Fernandez, ...		
		4			
Mangalore, ...	Sago.	1	Pedre Proboo, ...		
Travancore, ...	Sago.	1	Local Committee,..		
		2			
Pondicherry, ...	Palmiraroot Starch.	1	Mr. J. C. Peltier, ...		
Do. ...	Palmiraroot Starch.	1	J. Filatrian, ...		
Mangalore, ...	Palmiraroot Starch.	1	Pedre Proboo, ...		
Madras, ...	Palmiraroot Starch.	1	Nazareth Royappo Pillay, ...		
Chingleput, ...	Palmiraroot Starch.	1	Moothen, ...		
		5			

TABLE No. 6.—*Continued.*

Where grown.		No. of Samples.	Names of Contributors.	Remarks by the Sub Committee.	Confirmation or otherwise, with remarks by the General Committee.
Hydrabad, ...	Plantain meal.	1	Cunniah		
Madura, ...		1	Rev. C. A. Little ...		
Do. ...		1	Francis Ashbury ...		
Tanjore, ...		1	Hurry Row		
		4			
Coimbatore, ...	Amarantus frumentaceus.	2	... ...		
		2			
Pondicherry, ...	Mango Starch.	1	Mr. Perrotet		
		1			
Hydrabad, ...	Cat Samb-ul.	1	Mr. J. Murray ...		
		1			
Hydrabad, ...	Singhara.	1	Mr. J. Murray ...		
		1			
Hydrabad, ...	Bombay heptaphylla	1	... ...		
		1			
Hydrabad, ...	Salep.	1	Capt. Davies... ...		
Do.		1	Dr. Riddell		
		2			
Travancore, ...	Yams.	9	Local Committee,...		
Malabar, ...		10	... ...		
		19			
Travancore, ...	Unclassified specimens.	4	Local Committee,...		
		4			

TABLE No. 6.—*Continued.*

Where grown.		No. of Samples.	Names of Contributors.	Remarks by the Sub-Committee.	Confirmation or otherwise, with remarks by the General Committee.
Bellary, ...	Cane Sugar.	3	Local Committee,...		
Chingleput, ...		1	... ...		
Salem, ...		1	Local Committee,...		
Do.		1	... ...		
Pondicherry, ...		1	.. ..		
Hydrabad, ...		9	... ...		
Do.		1	Dr. Smith, ...		
Madras, ...		14	Chamber of Commerce, ...	Interesting Collection.	
Palmanair district, ...		1	H. Talputt, Esq., ...		
Chittoor, ...		4	Do.		
Arcot, ...		1	Do.		
Aska,............		1	Messrs. Binny &. Co.	Verv good.	
Rajahmundry,		1	Narrainsawmy,......	Excellent of its kind.	
Do. ...		5	Messrs. Arbuthnot &. Co.	Fine bags of Sugar in crys., all excellent, but in different degrees of refinement.	
Coimbatore, ...		1	... ...		
Kurnool, ...		2	... ...	Very common.	
Cuddapah, ...		1	... ...		
Vizianagrum,...		1	... ...		
		48			
Bellary, ...	Date Sugar.	1	Local Committee,...		
Madras ...		4	Narainsawmy, ...		
		5			
Chingleput, ...	Palmira Sugar.	1	....	Ordinary quality.	
Pondicherry, ...		2	Local Committee,...		
Bellary, ...		1	Do.		
Madras, ...		3	Narrainsawmy, Abkarry Suptt....		
Kurnool, ...		1	... ...	Very common.	
Rajahmundry, ..		2	Messrs. Arbuthnot & Co.		
		10			
Pondicherry, ...	Cocoanut Sugar.	1	Local Committee,...		
Madras, ...		3	Narrainsawmy, Abkarry Suptt....		
Chingleput, ...		1	....	Ordinary quality.	
		5			

TABLE No. 7.

Shewing the number in gross of Dry grains and Pulses grown in the different Districts named below; under this heading Wheat, Maize, Barley, great Millet, Black Millet, Italian Millet, Sawrway, Caday-canny, Pilarisee, Varagoo, Raggy, Spiked Millet, Bamboo Rice, Grasscorn, Bullar Caramany, Dholl, Oolundoo or Mash, Green Gram, Mussoor, Peas, Country Gram, Wild Gram, Bengal Gram, Beans, Raj-jeera are included.

Where grown.	No. of Samples.	Names of Contributors.	Remarks by the Sub-Committee.	Confirmation or otherwise, with remarks by the General Committee.
Tanjore, ...	34 Bottles & 2 Bags	Hurry Row, ...	Generally very good samples of the above mentioned grains and pulses, including a fine specimen of *American maize*. Regarded as a whole, this collection is superior to all the rest.	
Cuddapah, ...	45	Local Committee,...	This collection is generally very good, the Cholum is superior to that received from any other District.	
Coimbatore, ...	18	Local Committee and others, ...	1 Bag and 17 Trays, generally inferior.	
Bangalore, ...	32	....	Not calling for particular remark.	
Chittoor, ...	1	Miss Pereira,.........	With remarks on cultivation and use.	
Vizianagrum, ...	28	H. H. the Rajah, ...	These samples have become much damaged from not having been well put up, but appear to have been good.	
Ootacamund, ...	5	Mr. McIvor, ...	French Beans from Mr. McIvor, with explanatory paper, excellent quality, very well dried and put up.	
Chevoroy Hills, ...	1	Chinniah Mood. ...	A large sample of wheat of fine quality.	
Pondicherry, ...	27	Local Committee, Monsr. Perrottet and others,.........	Good samples of the ordinary grains, excepting the peas, which are very superior.	
Madras, ...	21	Messrs. Walker and Co's Dubash, ...	All ordinary samples.	
Masulipatam, ...	19	Local Committee and others, ...	Generally of fine quality, but nothing special to be remarked of any single sample.	
Bellary, ...	22	Local Committee and others, ...	Generally of fine quality a grain stated to be a kind of Lentil, is the only peculiarity (Mussoor.)	
Kurnool, ...	23	Local Committee and others, ...	Generally of ordinary quality, nothing deserving of special notice.	
Hyderabad,............	23	Local Committee and others, ...	Generally of good quality, the wild sword bean seems to be the only thing deserving of special notice (Canavalia gladiator.)	
Mangalore, ...	10	Pedre Proboo and others	All of ordinary quality.	

TABLE No. 7.—*Continued.*

Where grown.	No. of Samples.	Names of Contributors.	Remarks by the Sub Committee.	Confirmation or otherwise, with remarks by the General Committee.
Pegu, ...	6	Dr. Brandis,.........	Of ordinary quality, except lablab vulgaris, which is said to be valuable as a table vegetable.	
Tinnevelly, ...	11	Local Committee and others	Of ordinary quality.	
Chingleput, ...	20	Local Committee and others	Generally of ordinary quality, excepting the Cholum, which is very fine next to that of Cuddapah.	
Poodoocottah, ...	6	....	Nothing remarkable.	
Travancore, ...	16	....	All of good quality, but nothing of special importance.	
Malabar and Chingleput, ..		....	Have sent Cocoanuts, but neither appear to have any peculiar excellence.	
	379			

THREE QUALITIES ALL GOOD.

Tobacco, Tanjore No. 1, and 1 bottle of seed.
Do. Rajahmundry, No. 2.
All the others inferior.
Mace, Messrs. Binny and Co. very fine.
Do. Augaracandy inferior.
Cassia, do fair.
Cinnamon, Binny and Co. very fine.
Cloves, do. second Tinnevelly, and Nutmegs finest, Col. Cullen.
Cardamoms, Coimbatore common.
Do. Ceylon peculiarly rare.
Pepper black, and white best Malabar, Tellicherry.
Dry Ginger, best Hyderabad.
Do. second Pondicherry.
Green ginger, Pegu very fine.
Corianders, Hurry Row best.
Do. second Masulip., L. C.
1405 Chillies Bellary L. C. and Chingleput 644 first.
No. ◇ Coffee Pea Berry, Fischer and Co.
Large do. do. do.

3605 ⊙ Binny and Co. Pea Berry and Large Coffee.
7097 + Pedro Probao, Pea Berry Coffee.
4 ♉ Bags down below, 8636, Tinnevelly, T. Vasudavoo.
2758 ⊸ Two Boxes Cary Bappoo.
12 Bags Shevaray Hills 5069. ⊖ Ashton and Richardson.
Betel Nut, best, Pedro Probao.
Do. Pegu fine,
Various, Bellary best.
Garlic, Hyderabad, best: no other samples sent in.
Aniseed, Hyderabad best.
Cummin, Bellary best.
Caraway, Madura best.
Omum, Bellary best.
Dill seed, Hyderabad best.
Nigella Sativa, Pondicherry best: no other sent in.
Mustard seed, Tanjore, Hurry Row.
Do. white Hyderabad.

CHEMICAL SECTION OF THE REPORT ON CLASS III.

NOURISHMENT FROM THE VEGETABLE KINGDOM.

For the first suggestions relative to the importance of nitrogen in alimentary substances mankind is indebted to Majendie, his views were subsequently confirmed by the elaborate and striking experiments of Tiedeman and Gmelin; they were however strongly denied by numerous writers who adhered to the older views, among these was Dr. Stark, who endeavoured to support himself on a non-nitrogenous substance (sugar) and thereby lost his life, thus affording an almost incontrovertible proof of the correctness of the opinions he had combated.

From this time, indeed from the first announcement of Majendie's views, the attention of Chemists and Physiologists has been more or less constantly directed to this subject, as his talent or opportunity allowed, contributing something to the general stock of information; even to name all these benefactors to science would occupy too much time, yet it is impossible to omit some passing tribute to the memory of Gay Lussac. That great chemist discovered that nitrogen was present in the seeds of the cerealia. This discovery led to searching investigations, to ascertain in what parts of grains the nitrogen was contained, and what were the peculiar composition and properties of these parts; they were found to bear a remarkable similarity to the white of egg or albumen, and hence the general designation of these compounds as albuminous substances.

From this moment new facts brought forward by a host of able men, crowd upon the investigator so thickly, that it is useless to attempt to discriminate individual merits or contributions. The results of all these labours, may be thus stated. Firstly, three forms of nitrogenous substances have been found both in animal and vegetable organizations, distinguished by the terms albumen, fibrin, and caseine. Secondly, that the chemical composition of these three substances, is identical. Thirdly, that when introduced into the living organism, each is capable of being converted into either of the other forms.

Now the bearing of these results on the value of any kind of food, composed, or partly composed of albuminous substances, depends on a knowledge of certain laws that obtain in the living animal, and as these have no where been so lucidly explained or interpreted as in the animal chemistry of the great Philosopher of Giesen, a reference to his work is here almost indispensable. At page 48, third edition, he says while explaining and defining the term *food*, " that only those substances can properly be called nutritious which are capable of conversion into blood." The principal ingredients of blood are found to be fibrin and albumen, and these substances contain besides the carbon, hydrogen and oxygen found in gum, sugar, starch (and all kinds of food termed farinaceous,) nitrogen, sulphur and phosphorus. These elements are also found in all the organized parts of the body, the only parts containing neither of these, are water and fat.

The striking facts just stated naturally lead to the inference, that the albuminous substances which contain all the elements required, and which are taken as food into the body, do furnish all that the blood (and structures made from it,) may need; unless the possibility of such bodies as nitrogen, sulphur, &c., being formed or eliminated by some secret process in the living organism presents itself to the mind, and mingles doubt with the conviction that would otherwise follow. Such a possibility, did occur to the minds of many thinking men, and the doubts arising from it have only been dispelled by patient years of investigation. Liebig thus refers to the subject. "The most decisive experiments and observations have proved, that the animal organism is absolutely incapable of producing or creating an elemetary body, such as nitrogen, sulphur, or phosphorus; it therefore inevitably follows that all kinds of food fit for the production of blood, must contain sulphur, nitrogen, and phosphorus, in a soluble form." Now all the forms of vegetable albumen fulfil all these conditions. Vegetables in fact prepare in their own organisms, the food that is necessary to animals, and thus is shewn the mutual dependence of the kingdoms of nature, and the constant circulation of elements, which exist originally in an unorganized state in the mineral kingdom, are thence transformed by vegetables into organized substances, and in this state presented to animals, by whom they are again restored in an unorganized state to the kingdom from whence they were first taken.

The paramount importance of albuminous or nitrogenous substances, and the uses which they serve, being thus made evident, it remains to ascertain the uses of those alimentary substances which contain no nitrogen.

These kinds of food are composed of carbon, hydrogen and oxygen; the hydrogen and oxygen being in the proportion to form water, thus leaving the carbon wholly unoxidized; or if we suppose the oxygen to be divided between the carbon and hydrogen, a surplus of carbon and hydrogen that is unoxidized, remains. We are now speaking in reference to what takes place, after the food has been taken into the body, and there submitted to assimilation. How the carbon, or carbon and hydrogen are made use of by the animal, may be seen from the following facts.

From the moment an animal is born till it dies, oxygen is taken into its body through the skin and lungs, and given out again by the same channels

in the form of compounds of carbon and hydrogen, *i. e.* as the vapour of water and carbonic acid; that it is the carbon and hydrogen of the food that enables the animal, with the oxygen inspired, to form and give out these products, is proved by what happens, when an animal is left without food. We see that in such circumstances its bulk and weight decrease till it dies, but until death takes place, it continues to take in oxygen, and to give it out again in the form of carbon and hydrogen compounds. Whence then does it obtain the carbon and hydrogen thus given out? the wasting and decrease of weight answer plainly,—from the tissues and other parts of its own body. The animal is in truth destroyed by the action of the inspired oxygen, on account of its powerful affinity for carbon and hydrogen, for when the animal has no longer any superfluous carbon and hydrogen capable of combining with the oxygen, it seizes on the carbon and hydrogen of the animal's own body; in the first instance for example, the fat which is almost all carbon and hydrogen, is to satisfy the oxygen absorbed into the circulation, and after combination, given off as carbonic acid and water. These processes go on till the animal is exhausted, and dies; it is therefore clear, that food containing a surplus of carbon and hydrogen is necessary to the animal, in order to support *respiration*, without destroying its structure.

At the same time that this kind of food supports respiration, and defends the organization of the animal from the action of the oxygen inspired, it fulfils another most important purpose. viz: that of maintaining *animal heat*, it does this, in obedience to a law so absolute and universal, that no exception is known, the law, alluded to, is, "That whenever oxygen combines with a combustible, heat is developed;" it matters not whether this combination be rapid or slow, or whether it be in or out of the body, heat is always developed, its influence even extends to the flowering of plants, the maturation of fruits, and the germination of seeds.

The operation of malting may be cited as a familiar instance of the last effect named. The slow combinations of oxygen with combustibles in a finely divided state, have led to the destruction of ships, stacks, granaries, &c. &c., and are fearful illustrations of this law. The black powder of platinum, or the sponge of the same metal, condenses oxygen, and therefore, when hydrogen is thrown by the aid of a jet on either, combustion ensues; but it is needless to multiply instances.

One important fact bearing directly on this subject, should not however be omitted. The temperature of the tropics when compared with that of the polar regions exhibits a difference of 50 or 60 degrees, or even a much greater difference, yet the bodies of those who dwell in either climate are found to preserve the same amount of heat; it is therefore impossible that the temperature of animal bodies should depend on external circumstances, but must proceed from internal causes; what these* are, has been already shewn, and how they depend on the supply of non-nitrogenous food.

The two grand uses to which food is adapted by its composition, having, by a reference to the animal structure, and to some of the more important actions that take place in its organism, been traced out, the same mode of proceeding will be made use of, to determine the purposes for which the remaining ingredients of food are available. These are the salts, viz., iron, phosphate of lime, chloride of sodium, with other salts of sodium, potash and magnesia. Here the inquiry is so simple that it will occupy a very brief space. Analyses of the blood, of the bones, and of the principal secretions, point at once to the uses of the salts and shew the necessity of their presence. It is true that all the purposes to which the salts serve are not known, but enough is ascertained to prove that the blood, bones and the secretions, cannot remain in a normal condition without a constant supply, and therefore without overstepping the modesty of truth, the use to a certain extent, as well as the reason why these inorganic ingredients are present in food, may be said to be ascertained.

From the above, it will be seen, that the business of the Chemist when analysing any kind of food with a view to determine its value, will first be to separate the three kinds of ingredients, and subsequently to determine the quantity, in which each of these kinds is present.

Ultimate Analysis of some of the Grains commonly used as food by the native inhabitants of India.

Rice, Raggee, Cumboo, Cholum.

The following analyses were made in reference to the ascertained uses of the different ingredients of food in general, and the results have been accordingly arranged under three heads, viz., nitrogenous, non-nitrogenous, and inorganic ingredients.

The grains selected for examination, were average samples of the last crops, and all obtained from the neighbouring bazaars.

After finely powdering a small quantity of each grain, the presence of the usual proximate elements contained in the seeds of the cerealia, was ascertained by qualitative examination.

The following process was employed. From three to six grammes of flour were placed in a cotton bag, composed of three layers of fine cloth, and kneaded under water, till the washing water gave no reaction with tincture of iodine; the water containing the

* It is not intended here to include the nervous influences, under which the Absorbents and open vessels take up or reject such atoms as the necessities of Organism require, it is merely intended to say, that while these influences are active, the particles of Carbon and Hydrogen are those which when taken up, and while undergoing oxidation, are those which keep up the animal temperature.

starch was placed on filters; the filtrate was boiled down till the matter which was thus rendered insoluble (vegetable albumen) was capable of being separated by the filter. The filtrate was now still further concentrated; when about half an ounce remained, alcohol in equal bulk was added, a precipitate shewed the presence of gum; the whole was now evaporated to dryness in a water bath (to get rid of the alcohol), a little water added, gave a solution containing sugar, salts, and coloring matter; the sugar was detected by the reduction of oxide of copper to the sub-oxide, and the presence of the salts was demonstrated by igniting the residue, obtained by evaporating to dryness half of the solution containing sugar, &c.; the husks remained in the bag used in the beginning of this examination.

To ascertain the nature of the salts present, a larger portion of each powdered grain was placed in a crucible, and exposed to a bright red heat, which was kept up till some time after all evolution of gaseous matter had ceased. The charcoal thus obtained, after being powdered was treated with dilute nitric acid, copious evolution of carbonic acid; it was afterwards digested several hours on a sand bath; the whole was then thrown upon a filter, and finally extracted with water, till all the soluble matters were withdrawn. The filtrate obtained, shewed the presence of the following bases and acids.

Bases.	*Acids.*
Iron, lime, magnesia,	Carbonic, Phosphoric,
Soda, Potash.	Sulphuric, Hydrochloric.

The following quantitative experiments were now made. A bag made for the purpose as previously described, and which had been washed in aqua destillata, till not a trace of starch was retained, was dried in a bath heated to 212° F., and accurately tared. A portion of rice finely powdered, after being dried in the same way, was placed in the bag, and the weight of the whole taken. This gave by a Giesen balance 6,6002 grammes, for the weight of the rice employed. The bag with contents was now placed in a wide mouthed jar, containing sufficient distilled water to cover the bag, the jar was then loosely covered to avoid dirt, and allowed to stand 6 or 8 hours. The bag with its softened contents was then kneaded under successive portions of aqua destillata, till no trace of starch remained; to ascertain this, a portion of the washing water taken out by a glass rod, was tested by tincture of iodine. The bag was now taken out of the starch water, and carefully washed over it, then hung up to dry for a time, and finally placed in a bath heated to 212° F. The jar containing the starch water was allowed, after being covered again loosely, to stand till all the starch had subsided; the clear supernatant fluid was then gently removed by a small beaker, and poured on a filter, several of which were required, in consequeuce of the first used having become clogged up; these filters had all been dried and tared. After the starch on the filters had been well washed, the filters were all loosely covered and set in a warm situation to dry, finally placed in a water bath, after having been removed from the funnels, their edges folded over and set in separate small dishes. These filters after having remained twelve hours in the water bath, were perfectly dried. The weight of the starch they contained, after having deducted the tare of the filters from the gross weight,=5,620.

The bag and its contents, consisting of husks and matter adhering to them and insoluble in cold water, gave after deducting the tare of the bag from the gross weight, 0·4305, for husk and insoluble residue.

The filtrate from the starch, containing all the matters soluble in cold water, was placed in a large dish and evaporated to dryness, the contents carefully washed into a weighed capsule, and again evaporated in a water bath, to dryness, gave for the soluble matters, 0·2770.

These figures shew a small loss, which from the nature of the process was inevitable.

$$5{\cdot}620 + 0{\cdot}435 + 0{\cdot}2770 = 6{\cdot}3320.$$

This loss, nevertheless, is by no means so great as to defeat the object of the experiment, when carried out into percentages, it amounts to something less than 4 per cent., while the experiment gives some insight into the composition of the grain, and will further serve as a safeguard against any serious error, when conducting more refined and delicate methods of research, which to a person, who is in a great measure shut out from all the records of chemical science, and obliged to rely entirely on his own experience, is an advantage not to be overlooked; for these reasons, all the other grains were treated in the same manner.

The results are seen below.

Grains.	Starch.	Husk &c.	Soluble residue.	Percentage.
Rice, ...	85·1500	6·605	4·200	96.100
Raggee, ...	76·3121	11·834	9·421	95·577
Cumboo, ...	77·920	10·921	7·892	96·713
Cholum, ...	78·824	8301	8·621	95·742

From these results it was obvious, that all the grains experimented on, contained about $\frac{5}{8}$ of their whole weight of starch, or rather more of substances having a similar composition, if the gum and sugar be taken into account. To determine the exact amount of these substances, which may all be represented by the formula $C_{12} H_{10} O_{10}$, two approved methods were open to me, viz. that of combustion, or that of loss of carbonic acid; as the latter appeared the easier, and as I should certainly be obliged to make some combustions, to determine the nitrogen, this was selected. It is found,

on that discovery of Kirchoff, which gained for him an annuity of 1,000 roubles while living, and since his death, a name which belongs to science, and which death cannot take from him, viz. that of acting on the grains in powder by some dilute acids, but especially sulphuric, which have the power of converting starch, when assisted by continued boiling, into grape Sugar, which has the formula $C_{12}\ H_{14}\ O_{14}$: the result therefore of the action which takes place, is the fixatiou of four equivalents of water, the conversion is known to have been effected when a rod, dipped into the liquid, no longer gives the reaction with tincture of iodine. The grape sugar produced is then treated with a ferment, first having been introduced into an apparatus, such as is used for the determination of carbonic acid, but of larger size. The amount of ferment used must be exactly taken, and subsequently that of the whole apparatus.

Another portion of ferment is to be introduced into another flask, and the weight of this flask and contents taken with equal exactness; it is also indispensably necessary that the yeast or other ferment, must be a portion of the same that was used with the grape sugar, and must also be put into the trial flask at the same time, and kept during the whole operation under precisely the same circumstances.

Both flasks will give off carbonic acid after two days, both are weighed, and the weighing is continued every hour afterwards, till the weight is constant. By deducting the loss shewn by the trial flask, from the larger amount shewn by the flask containing grape sugar, the loss attributable to the ferment alone is ascertained; the loss above this denotes what is attributable to grape sugar, and as every equivalent of grape sugar is equal to one of starch, it is easy to find what the loss of carbonic acid represents, for it is also known, that one equivalent of starch, yields four of carbonic acid. To see how starch or its representative grape sugar yields four equivalents of carbonic acid, it is necessary to take into consideration what the other products of the action of a ferment on grape sugar are, and these are found to be two equivalents of alcohol, and two of water. The reaction worked out according to the known fomula of grape sugar and its products, proves this to be the case.

Grape sugar has the formula

	C_{12}	H_{14}	O_{14}	
deduct	C_{8}	H_{12}	O_{4}	= to 2 Equivalents of alcohol.
remain	C_{4}	H_{2}	O_{10}	
detuct	C_{4}		O_{8}	= to 4 Equivalents of Carbonic acid.
remain		H_{2}	O_{2}	= to 2 Equivalents of Water.

From these figures, it is plain that four equivalents of carbonic acid represent one of grape sugar and one equivalent of grape sugar represents one of starch, therefore to find the amount of starch and the other ternary compounds of carbon, hydrogen and oxygen, contained in grain, which are all expressed by the formula $C_{12}\ H_{10}\ O_{10}$, before given as that of starch, it is only necessary to convert the formula $C_{12}\ H_{10}\ O_{10}$, into figures, thus:—

$$C = 6 \times 12 = 72$$
$$H = 1 \times 10 = 10$$
$$O = 8 \times 10 = 80$$
$$162$$

And at the same time to convert the formula for carbonic acid in a similar manner,

$$CO_2 \quad \begin{cases} C\ 6 = 6 \\ O\ 8 \times 2 = 16 \end{cases}$$
$$22 \times 4 = 88;$$

because there are four equivalents of carbonic acid, and therefore, as 4 equivalents of CO_2 are to one equivalent of starch, so is the CO_2 lost to the starch required.

4 Eqs. of CO_2	1 Eqs. of Starch	CO_2 lost	Starch required
88 :	162 : :	:	x

Five sets of the necessary apparatus were set up, all carefully marked by the file, the fifth being used as the trial flask. Having no yeast at hand, the ferment employed was toddy, to the use of which there appear to be strong objections, which it is not necessary to state now, but which are sufficient to deter me from using it in future.

Flask No. 1, Rice.

Grammes 5·1600 of finely powdered rice taken, after having been well dried at 212° Fah., were converted into grape sugar—and lastly treated by an equal weight of toddy to that in the trial flask, at the end of the operation there was,

A total loss of carbonic acid, = 3.67
and loss due to the toddy, = 1.24

Loss arising from grape sugar 2.43

5·1600 : 2·43 : : 100 : x

x = 47·09 CO_2 lost per cent.

CO_2	Starch	CO_2	
88 :	162 : :	47·09 :	x

x = 86·68 per centage of starch in rice.

Flask No. 2, Raggee.

5·4801 grammes of finely powdered raggee taken after having been dried as above—

Total loss of carbonic acid, = 3·98
Loss due to the toddy, = 1·63

Loss from grape sugar, 2·35

5·4801 : 2·35 : : 100 : x

x = 42·88 Percentage loss of CO_2

88 : 162 : : 42·88 : x

x = 78·90 percentage of starch in raggee.

Duplicate determinations of Starch in *rice* and *raggee* both failed, in consequence of the badness of the toddy employed. A third for each of these

grains failed in consequence of accidents. Determinations for *cumboo* and *cholum* were after several attempts obtained, but the time taken up in obtaining them made it more advisable to verify them by making combustions, than by repetitions.

Flask No. 3, *Cumboo.*

5,89 grammes of finely powdered *cumboo*, after having been dried at 212°, and placed in the CO_2 apparatus shewed, at the close of the operation;

Loss of CO_2, ... = 3. 75
Loss from toddy, ... = 1. 14

2. 61

5.89 : 2.61 : : 100 : *x*.
x= 44.31 precentage loss of CO_2
88 : 1.62 : : 44.31 : *x*.
x= 81.47 percentage of starch.

Flask No. 4, *Cholum.*

5,08 grammes of finely powdered *cholum* dried at 212° F. and placed in the CO_2 apparatus, shewed at the close of the operation,

A loss of CO_2,... ... ... = 3. 85
The loss from toddy, ... = 1. 62

Loss of CO_2 from grape sugar, ... = 2. 23

5.08 : 2.23 : : 100 : *x*.
x= 43.89 per cent. loss of CO_2
43.89 : *x*.
x= 80.78 percentage of starch.

The results of the foregoing determinations of the non-nitrogenous ingredients contained in rice, raggee, cumboo and cholum, being unconfirmed, except by those of the first process which was not expected to furnish more than approximations, claim no notice in this place, they will, however, hereafter afford a means of comparison.

The principles on which combustions of substances composed of carbon, hydrogen and oxygen depend, with all the steps in the manipulation, the cautions to ensure success, and all the parts worthy of notice in this invaluable process, as well as the methods of calculating the results obtained by it, are so admirably given in Fresenius' work on quantitative analysis, that it will be quite unnecessary for me, to do more, than to make such references as will serve to explain the results I have obtained. When substances having the composition stated above, are burned with free oxygen as in the original process of Lavoisier, or with other substances which readily afford oxygen, carbonic acid and water are the results, and if these can be separately collected and weighed, the amounts of carbon and hydrogen can easily be calculated, as the composition of carbonic acid and of water is perfectly well known. The apparatus used to effect these ends, owes its perfection to Liebig; it consists of a tube of refractory German glass, containing no lead, which is drawn out at one end into a sealed point bent upward, to the open end, which during the operation projects beyond the furnace; a small tube containing chloride of calcium is fitted by the aid of a perforated cork, which must be air tight to both tubes, this tube retains all the water formed during combustion, but permits the carbonic acid to pass into a bulb apparatus partly filled with strong potash; this apparatus, known as Liebig's bulbs, is connected to the chloride of calcium tube by a caoutchouc connecter, this retains the CO_2. As one example of the required calculations, will explain how all the results of the combustions to determine carbon and hydrogen have been obtained, that for the first of these operations is now given.

0.4450 grammes of rice flour, which previous to taking the weight had been 12 hours in a water bath heated to 212° F. gave, after the combustion was finished, an increase of weight to the potash bulbs of .7310 grammes; this is the weight of the carbonic acid formed by combustion; the chloride of calcium tube shewed an increase of .2565 grammes, which is the weight of the water formed. Now one equivalent of carbonic acid is represented (as before shewn) by 22. And the combining weight of carbon is 6, *i. e.* if we reckon by the hydrogen scale which is always used by English Chemists, therefore

one equivalent (contains) of carbonic acid		one equivalent of carbon		the carbonic acid obtained	
22	:	6	: :	.7310	: *x*

x = .1994 carbon in the amount of subatance taken

0·4450 : .1994 : : 100 : *x*
x = 44·80 the percentage of carbon.

Again, the equivalent of water is 9, of which 8 is the oxygen and 1 the hydrogen thereof,

one equivalent of water		the equivaleut of hydrogen		the water obtained	
9	:	1	: :	·2465	: *x*

x = ·0274 hydrogen in the amount of substance taken,

0·445 : ·0274 : : 100 : *x*
x = 6·15 percentage of hydrogen.

The values thus obtained, viz., 54.810 for the percentage of carbon, and 6.15 for the percentage of hydrogen, will be found in the results set down for the first combustion of rice. The other values have been calculated in the same manner. In substances composed of carbon, hydrogen and oxygen, it is almost needless to observe that if the sum of the carbon and hydrogen be known, the difference between this and the original weight of the substance burned, is that of its oxygen. It remains only to describe with as much brevity as possible, the principle on which combustions for the determination of nitrogen depend, when the nitrogen is not in the form of nitric acid, in which case this process, known as that of Varentrapp and Will, is inapplicable; where the nitrogen, as in the case of grains, is found in the compound termed vegetable albumen, it is admirably suited for its determination, and depends on the fact, that when such nitrogenous bodies are ignited with the hydrate of an alkali-metal, the hydration water of the latter is decomposed, so that its oxygen combines with the carbon of the substance undergoing combustion, while the hydro-

gen at the moment of its liberation goes to the whole of the nitrogen present. The hydration water is best furnished by a mixture of caustic soda and lime, which is prepared for this purpose, and is known as soda-lime : this retains without deliquescing, a sufficient amount of hydrative water even when made tolerably warm ; thus giving the means of mixing it with the substance to be burned. The mixture is burned in a tube of german glass shaped as before mentioned, the end that projects from the furnace, is connected by a perforated cork with a bulb apparatus containing hydrochloric acid, which, on account of its strong affinity for ammonia, retains the whole of this gas, while it permits other gaseous products to escape. To afford a compound that will not suffer loss during evaporation, bichloride of platinum in excess is added, which forms with the chloride of ammonium, the double salt called the ammonio-chloride of platinum. The formula of this salt is $NH_4Cl, PtCl_2$; now referring to the scale of equivalents it will be seen, that this formula represents the numbers that follow,

N = 14 = 14
H = 1 × 4 = 4
Cl = 35·5 = 33·5

53·5 Chloride of ammonium.

Pt. 98·68 = 98·68
Cl. 35.5 × 2 = 71·00

169·68 Bichloride of platinum.

And 53·5 + 169·68 = 223·18 the double salt; now this double salt contains as is shewn above 14 parts by weight of nitrogen ; therefore whatever weight of the double salt results from the operation, we can find how much nitrogen it contains, thus in the first combustion of rice to determine nitrogen it will be seen, that 1·2230 grammes gave at the conclusion of the process, 2·932 grammes of ammonia-chloride of platinum, therefore

As one equivalent (holds) of the double salt		one equivalent of nitrogen		the double salt found.	
223·18	:	14	: :	·2932	: x

will hold an unknown quantity of nitrogen which is represented by } x which=.0184

The unknown amount of nitrogen being now found, the percentage is calculated in the usual way

If 1·2230 : ·0184 : : 100 : x

x = 1.542 the percentage of nitrogen contained in rice.

The nitrogen found in the seeds of the cerealia, it has been before stated, is in the form of vegetable albumen, which, according to the best analyses published, has the composition here shewn. Three forms of albuminous vegetable compounds are given:

	Albumen.	*Caseine.*	*Fibrin.*	*Mean.*
Carbon,... ..	54·74	54·14	54·09	54·30
Hydrogen,......	7·77	7·16	7·30	7·40
Nitrogen,......	15·85	15·67	15·65	15·70
Oxygen,... ... } Sulphur,... ... } Phosphorus, }	21·64	22·03	22·93	22·20
	100·00	100·00	100·00	100·00 nearly.

These numbers are taken from Gregory's chemistry, and by him selected from the researches of Liebig, Mulder and Dumas, but he expressly says, at random, thereby shewing the identity of composition in these substances, for it is evident from a glance at the numbers that they do not differ from each other, more than two analyses of one substance usually do. For this reason the mean of the three analyses has been found, and used to calculate what proportion of carbon, hydrogen, oxygen, &c. belong to the nitrogen found in each grain. The mode of calculating is sufficiently simple, for, if (taking the mean) 15·70 of nitrogen combine with 54·30 of carbon, then the amount of nitrogen found in each grain will combine with carbon according to the same proportion, the same is also true with respect to hydrogen, oxygen, &c., when these separate amounts which together form the vegetable albumen have been found, they are deducted from the gross amounts of carbon, hydrogen, and oxygen. The remainder of the carbon, hydrogen and oxygen, being known to exist in the form of substances having the formula $C_{12} H_{10} O_{10}$, a more exact method of calculating the amount of oxygen is obtained, for as before shewn, this formula converted into figures, gives a total of 162, out of which 80 belongs to the oxygen, therefore by the aid of the carbon and hydrogen which have been found by combustion, it is easy to find the required amount of oxygen. By these means the results of analysis, are made to exhibit in percentages, the amounts of nitrogenous and non-nitrogenous ingredients. By the percentage of the ash found by ignition, the amount of inorganic ingredients has been determined, and consequently the results of the whole constituents in percents, arranged according to the purposes to which they serve on entering the animal organism can be displayed at one view, and is thus shewn in the following Tables.

The order in which these grains stand, is not that of their comparative value, as articles of food, but that of the succession in which the analyses were made.

Several were ineffectual on account of the difficulty of completely burning the husk, although the grain was reduced to an almost impalpable powder, the difficulty was overcome by adding a small quantity of chlorate of potash, which had been previously fused to get rid of every trace of moisture. Having no exhausting syringe the method of mixing was that of Bunsen, Mitscherlich, &c., a large

glass tube having been drawn out and sealed for this purpose.

No. 1. Rice.

This grain was of the ordinary kind used by the natives, unboiled and of the last crop, obtained in the bazaar, Wallajahbad. A sufficient portion was reduced to an impalpable powder, placed in a porcelain dish and kept in a water bath heated to 212° Fah. till it ceased to lose weight.

The rice employed was a part of that which had been used for the processes already described.

4.1850 grammes dried as above and burnt in a platinum dish, left .0202 grammes of ash.

0·4450 grammes burnt with oxide of copper gave, ·7310 grammes carbonic acid, and grammes ·2465 water.

Second combustion 0·7320 grammes gave after being burnt in the same way, 1·205 grammes carbonic acid, and ·3602 grammes water.

1·2230 grammes, burnt with soda-lime gave grammes ·2932 ammonia-chloride of platinum.

Second combustion 1·5505 grammes burnt as above gave ·3301 grammes ammonia-chloride of platinum.

These determinations correspond, when expressed in percentages to

Carbon,......44·87 }
Hydrogen,... 5·63 } The mean of the determinations.
Nitrogen,.... 1·43 }

Calculated from the mean of the analyses of vegetable albumen by the aid of the nitrogen found, the albuminous ingredients in this grain are,

Carbon,................4·97 }
Hydrogen,............ 67 } 9·08 nitrogenous ingredients.
Nitrogen,............ 1·43 }
Oxygen,Sulphur &c. 2·10 }

Calculated from the carbon and hydrogen found, after deducting carbon, hydrogen and oxygen for the above.

Carbon,......39·90 }
Hydrogen,... 5.18 } 89.08 non-nitrogenous ingredients.
Oxygen,.... 44·00 }

Percentage of ash found, 0·47 inorganic ingredients.

Total percentage..... 89·63

No. 2. Raggee.

This grain was obtained from the bazaar of Wallajahbad, was of the last crop, and an average sample of that used by the native inhabitants, was powdered and dried by the same method as the former grain.

4·5600 grammes of the dried raggee flour after ignition gave ·0472 grammes of ash.

0·6242 grammes after combustion with oxide of copper and chlorate of potash, gave 1·1051 grammes carbonic acid, and ·3470 grammes water.

A second combustion of ·5625 grammes gave ·9424 grammes carbonic acid, and ·2152 grammes water.

0·6760 grammes burnt with soda-lime, gave ·3091 grammes ammonia-chloride of platinum.

A second combustion of 1·2510 grammes with soda-lime, gave ·5995 grammes of ammonia-chloride of platinum.

A third combustion of ·6220 grammes with soda-lime, gave ·2701 grammes of ammonia-chloride of platinum.

These determinations give the following percentages :

Nitrogenous ingredients calculated from the Formula for Vegetable Albumen by the aid of the Nitrogen found.		Non-nitrogenous ingredients after deducting the portions belonging to the Nitrogenous.		Inorganic ingredients incorporated with former shewing the Total percentage.	
Carbon,............	9·88	Carbon,......	35·76	Ashes, ...	1·03
Hydrogen,.........	1·34	Hydrogen,...	4·76		
Nitrogen,..........	28·6	* Oxygen,...	39·73		
Oxygen, ... } Sulphur, &c. ...... }	4·04				
	18·12		80·25		99·40

* Calculated as before from C_{12} H_{10} O_{10}

No. 3. Cumboo.

This grain was likewise obtained from the bazaar of this place, and was an average sample of the last crop. It was powdered and dried, as the former grains were.

3·621 grammes after having been burned as before, yielded, 0·0464 grammes of ash.

0.6421 grammes after combustion with oxide of copper and chlorate of potash, gave 1·0532 grammes carbonic acid, and 0·3704 grammes water.

A second combustion, of 0·3852 grammes gave 0·6250 grammes carbonic acid, and 0·2315 grammes water.

0·7640 grammes burned with soda-lime, gave 0·2580 grammes, ammonia-chloride of platinum.

A second combustion of 0·5281 grammes burnt with soda-lime gave 0·1805 grammes ammonia-chloride of platinum.

This determination gives the following percentages :—

Nitrogenous ingredients calculated from the Formula for Vegetable Albumen by the aid of the Nitrogen found.		Non-nitrogenous ingredients after deducting what belongs to the Nitrogenous portion of the Grain.		Inorganic ingredients incorporated with the former shewing the Total percentage.	
Carbon,............	7·59	Carbon,......	36·89	Ashes, ...	0·73
Hydrogen,.........	1·03	Hydrogen,...	5·40		
Nitrogen,..........	2·19	* Oxygen,...	40·27		
Oxygen,........... } Sulphur, &c. .... }	3·11				
	13·92		83·27		97·93

* Calculated from the formula C_{12} H_{10} O_{10}

No. 4. Cholum.

This grain, like all the others, was obtinned from the bazaar of this place, was an average sample of the last crop, and was powdered and dried in the way previously stated.

3·0152 grammes after having been burned as before gave 0·0382 grammes ash.

0·4853 grammes after combustion with oxide of copper and chlorate of potash, gave 0·8123 grammes carbonic acid, and 0·2708 grammes water.

A second combustion of 0·7051 grammes, gave 1·1825 grammes carbonic acid, and 0·4012 grammes water.

0·7340 grammes bur ned with soda-lime, gave 0·2741 grammes ammonia-chloride of platinum.

A second combustion of 0·5800 grammes gave 0·2334 grammes ammonia-chloride of platinum.

These determinations give the following percentages :

Nitrogenous ingredients calculated from the Formula for Vegetable Albumen by the aid of the Nitrogen found.		Non-nitrogenous ingredients after deducting what belongs to the Nitrogenous portion of the Grain.		Inorganic ingredients incorporated with the former shewing the Total percentage.	
Carbon,............	8·47	Carbon,.....	37·22	Ashes,........	12·6
Hydrogen,.........	1·15	Hdyrogen,..	5·09		
Nitrogen,.........	2·45	* Oxyegen.	41·36		
Oygen,.......... Sulphur,.........	3·64				
	15·53		83·67		100·48

* As before.

A view of the results of the analyses of all four grains is shown below.

Grains.	Nitrogenous Ingredients.	Non-nitro genous Ingredients.	Inorganic Ingredients.
Raggee, ...	18·12	80·25	1·03
Cholum, ...	15·53	83·67	1·26
Cumboo, ...	13·92	83·27	·73
Rice, ...	9·08	89.08	0·47

The comparative value of the Indian grains Raggee, Cholum, Cumboo, and Rice, as articles of food will perhaps be more readily understood by the aid of the following Tables—which shew the results obtained for Wheat, Rye, Barley, Oats, &c. as determined by some of the most eminent Chemists.

The first of these Tables is extracted from an Appendix to the first part of Liebig's Vegetable Chemistry, the whole of the table is not given, as it contains analyses of straw and other substances only employed as food for Cattle. The analyst is M. Bousingault from whose "Economic Rurale" they have been taken, but as he has given only percentage figures—it has been necessary to recalculate his analyses, by working from the amounts of Nitrogen found by him—conducting the calculation in other respects as described at page 36-31.

Grains &c.	Nitrogenous Ingredients.	Non-nitrogenous Ingredients.	Inorganic Ingredients.
Wheat, ...	14·45	83·15	2·4
Rye, ...	10· 7	87·00	2·3
Oats, ...	13·93	82·07	4·0
Potatoes, ...	9· 5	86· 5	4·0
Beet, ...	10· 7	83· 0	6·3
Turnips, ...	10· 7	81· 7	6·6
Peas, ...	26·52	70·38	3·1

The second Table is selected from the results obtained by Mr. Horsford, his figures require no recalculation, having been worked out under the eye of the greatest of living Chemists, the whole paper being in fact as admirable an arrangement as it is in all other respects. See the London, Edinburgh and Dublin, Philosophical Magazine and Journal of Science (Third Series) November 1846, page 365.

Grains.	Nitrogenous Ingredients.	Non-nitrogenous Ingredients.	Inorganic Ingredients.
Wheat, ...	19·15	79·77	0·70
Rye, ...	11·92	85·65	1·33
Indian Corn, ...	14·66	84 52	1·92
Hordeum Distichon, ...	14·72	84·80	2·84
Avena Sativa,...	15·24	86·05	3·26
Oryza Sativa, ...	7·40	91.60	0·36
Pisum Sativum, ...	28·02	67·31	3·18
Phaseolus vulgaris, ...	28·64	66·70	4·38
Ervum Lens, ...	30·46	65·06	2·60
Salanum Taberasam,...	9·96	86·36	3·61
Daucus Carota, ...	10·66	84 59	5.77
Beta Vulgaris, ...	15·50	73·18	6·43
Brasica Napa Brasica.	9·24	90.32	4·01
Brasica rapa, ...	12·62	81·33	7·02

For the sake of convenience, the three foregoing Tables have been thrown into one, thereby presenting at a single view the whole results of Analysis, which not only offers the greatest facility for inspection, but in conjunction with the succeeding Table gives the same results at once under two aspects.

Results of Analysis A.

Arranged in percentages so as to shew the Composition of the different substances existing in the

Seeds &c. examined, together with their separate uses, as life sustaining compounds.

GRAINS.	Nitrogenous. Ingredients.	Non-nitrogenous. Ingredients.	Inorganic, Ingredients,
Raggee, ...	18·12	80·25	1 03
Cholum, ...	15 53	83.67	1·26
Cumboo,...	13·92	83·27	·73
Rice, ...	9·08	89·08	0·47
Wheat, ...	14·45	83·15	2· 4
Rye, ...	10· 7	87-00	2· 3
Oats, ...	13·93	82·07	4· 0
Potatoes, ...	9· 5	86 5	4· 0
Beet, ...	10· 7	83· 0	6· 3
Turnips, ...	10· 7	81· 7	7· 6
Peas, ...	26.52	70 38	3· 1
Wheat, ...	*19.15	79·77	0·70
Rye, ...	11·92	85·65	1·33
Indian Corn, ...	14·66	84·52	1 92
Hordeum distichon, ...	14·72	84·80	2·84
Avena sativa, ...	15·24	86 05	3·26
Oryza sativa,...	7·40	91·60	0 36
Pisum sativum, ...	28·02	67·31	3·18
Phaseolus vulgaris,... ...	28·64	66 70	4·38
Ervum Lens, ...	30·46	65 06	2·60
Solanum, tuberosum, ...	9 96	86·36	3 61
Daucus carota, ...	10·66	84·59	5·77
Beta vulgaris, ...	15·50	73 18	6·43
Brassica Napa, ...	9·24	90·32	4 01
Brassica rapa, ...	12·62	81 33	7·02

Results of Analysis B.

Arranged in per centages so as to shew the ultimate composition of the seeds &c. examined, without reference to the different compounds, existing in them, or their uses as life-sustaining compounds.

	C.	H.	O.	N.	Ash.
Rice,...	44·87	5·85	46· 1	1·43	0·47
Raggee, ...	48·64	6·10	43·77	2·86	1·03
Cumboo, ...	44·48	6·43	44·09	2·19	0·73
Cholum, ...	45·69	6·24	44·82	2·45	1·26
Wheat, ...	46· 1	5· 1	43· 5	2· 3	2· 4
Rye, ...	46· 2	5· 6	44· 2	1· 7	2· 3
Oats,...	50· 7	6· 4	36: 7	2· 2	4· 0
Potatoes, ...	44· 0	5· 8	44· 7	1· 5	4· 0
Beet, ...	42· 8	5· 8	43· 4	1· 7	6· 3
Turnips, ...	42· 9	5· 5	42· 3	1· 7	7· 6
Peas,...	46· 5	6· 2	40·	4. 2	3· 2
Wheat,...	45·69	6·76	43·23	3·00	0 70
Rye, ...	44·37	6·65	44·55	1·87	1 33
Indian Corn, ...	45·04	6 60	44·62	2 14	0·86
Hordeum, ...	45·50	6·89	44 68	2·34	2·84
Avena sativa, ...	46·50	6·64	45.59	2 39	3-26
Oryza sativa, ...	44·61	6·53	46·62	1·16	0·36
Pisum sativum, ...	45·12	6·73	38·92	4·42	3 18
Phaseolus vulgaris,...	45·07	6·63	39·03	4·47	4 38
Ervum Lens, ...	45·35	6·75	38·50	4·77	2·60
Solanum Tuberosum, ...	43·86	6·00	44·79	1·56	3·61
Daucus Carota, ...	43·34	6 22	43·90	1·67	5·77
Beta Vulgaris, ...	40.99	5 72	39·37	2 43	6·43
Brassica Napa, ...	45·32	6·01	46·68	1·45	4·01
Brassica rapa, ...	43·19	5·68	42·96	1·98	7·02

The most truthful exposition of the uses of the substances examined is unquestionably that which is dependent on their composition as shewn in Table A, but as the simple exhibition of percentages though not in keeping with the science of the day, affords a readier means of comparison with many published analyses of substances used by mankind as food, Table B will not be without its use, independent of the advantage of regarding the same subject from different points of view.

Assuming that the Tables A and B have been closely inspected, and supposing that what was stated in the outset of this Section has been borne in mind, attention will necessarily be drawn to those substances containing the largest amount of Nitrogenous Ingredients—these are found to be Peas, Beans, and Lentils, which undoubtedly are most efficient in repairing the waste of the animal tissues; next to these, the seeds of the Cerealia occupy the highest place, nor will our Indian grains in this respect be found at all inferior to the Wheat, Oats, Barley, Rye &c. of other countries. I may here observe that the amount of Nitrogenous ingredient found by Mr. Horsford in the particular sample of Wheat marked with a star is somewhat exceptional, as the mean of five other samples analysed gives for Nitrogenous ingredients 17·24, —why such a special value is attached to Nitrogenous ingredients will be evident, by comparing* the best analyses of these same Nitrogenous substances, with those of blood dried, and muscular tissues, the singular fact that all these analyses point to identity of composition, at once removes the veil, and shews why these Nitrogenous substances have been stored up in the organisms of a class of plants more widely diffused over the face of the Earth, than any other; while at the same time it reveals one ray of that beneficence and wisdom, whose immensity like space, our finite powers can neither estimate nor conceive.

BOTANICAL SECTION,

FOR CLASS III.

The following pages are submitted with great diffidence, as the reporter is well aware of the high attainments in Botanical knowledge of several of the Gentlemen composing this Jury, while soliciting their indulgence for the errors and omissions, which he doubts not they will discover, he begs them to remember that he has made the present attempt, only in the absence of better qualified men, and that he will receive any emendations or corrections with grateful acknowledgements.

* Analysis of

	Albumen.	Caseine.	Fibrin.
Sulphur,...	1.30	0.9	1.0
Carbon, ...	53.50	43.6	53.2
Nitrogen, ...	15 50	15.8	17.2
Hydrogen, ...	7 16	7.1	6.9
Oxygen, ...	22.54	22.6	21.7
	100.00	100.0	100.0

The above are taken from Liebig's Letters on Chemistry, see Letter XXIX, page 137.

That the Vegetable Kingdom furnishes most of the Substances employed as food by the Natives of Southern India, is so generally known, that it will appear but a natural consequence, that the contributions to this Class consist almost entirely of substances obtained from this Division of Organized Nature, it is however somewhat remarkable, that no samples of fruits have been forwarded, especially when it is considered that Mango, Loquat Guava, &c., afford the means of making excellent preserves and jellies. The food of the inhabitants of India is not however entirely confined to vegetables, since few native repasts can be considered complete, without Milk and Ghee. The only other animal product admitted by them, i. e. by the higher Castes of Hindoos, as far as I know is that derived from the Bee.

On inspecting botanically the whole list of substances composing Class III, they will be found to belong to the following natural Orders, which have been arranged for convenience in the Tabular form.

Natural Orders.	Articles of Food included.	
Gramineæ.........	Grains and Grasses.	
Leguminosæ......	Peas, Beans, Lentils, Tamarind, &c.	
Palmaceæ..	Cocoanut, Sago, Jaggery, Betelnuts.	
Marantaceæ.......	Arrow root.	
Musaceæ	Plantain.	
Anacardiaceæ . ..	Mango.	
Euphorbiaceæ	Cassava or Iatropha Manihot.	
Orchidaceæ.......	Salep.	
Ternstromiaceæ...	Tea plant,	Thein, Caffein, Theobromin.
Cinchonaceæ......	Coffee.	
Byttneriaceæ. ...	Cocoa Theobrama,	
Urticaceæ	Cannabis.	
Solanaceæ.........	Chillies, Datura, Tobacco.	
Lauraceæ...	(bark) Cinnamon, Cassia bark & buds.	
Myristicaceæ.	Nutmeg and mace.	
Myrtaceæ.........	Cloves.	
Piperaceæ.........	Pepper and Long Pepper,	
Cruciferæ	Mustard.	
Zingiberaceæ	Cardamom, Ginger and Turmeric.	
Liliaceæ.......... .	Onions and Garlic.	

The orders within the last bracket can scarcely be regarded as producing life sustaining substances, they produce substances usually employed as condiments, to flavour various kinds of food ; they certainly do not belong to Class III, as they are unable of themselves to support animal existence ; nevertheless, as they have been set down as part of Class III, they claim some passing notice in this report.

Of the orders not included in the last bracket, we have separate Sections to remark upon, according to the nature of the substances which they furnish. For instance, the Gramineæ and Leguminosæ are orders affording strictly life-supporting substances, as we find in them albuminous matters, or such as are capable of repairing the tissues, accompanied with starch, gum, or sugar in such proportion, as to support respiration, and preserve animal heat, while, these two opposite kinds of substances, are further associated with the inorganic ingredients, (such as alkaline and earthy salts, iron, &c.) required to keep the circulating fluids of animals in a healthy state, and to renew the solid frame-work of their organisms.

The Palmaceæ, Marantaceæ, and Musaceæ, furnish chiefly starchy, or saccharine matters ; and, though not destitute of the albuminous and inorganic constituents, their relative proportion is not such as to constitute them (under ordinary circumstances,) life supporting substances, true, that for a limited time these products will support life, but for no lengthened period, they are therefore properly speaking not life-supporting substances.

The instances in which the Anacardiaceæ, Euphorbiaceæ, and Orchidaceæ furnish substances that can be used as food, are rare and exceptional.

The Cinchonaceæ, Ternstromiaceæ and Byttneriaceæ, though differing so materially in so many other respects, agree in this, that each order furnishes a plant which yields a peculiar product, capable of affording a grateful beverage ; and these separate products, when analysed, have been found to yield a substance having in two instances Theine, and Caffeine, the same chemical formulæ. $C_{16}\ H_{10}\ N_2\ O_4$, The formula for Theobromine is homologous $C_{14}\ H_8\ N_4\ O_4$, the most singular circumstance connected with the history of these compositions is, that under the influence of oxidizing agents, and finally under that of ammonia, which yield products closely analogous to those obtained from Uric Acid, by oxidation and by ammonia. These three orders, therefore, when considered in reference to their food affording capacities, have a common connecting link, and may in this sense be said to form a Section in the list.

From the outline already given of the uses of the order Gramineæ, it will be evident that it is of paramount importance ; it is at the same time the one which furnishes by far the greater number of grains used as food ; it is said to contain nearly 4000 species, included under 291 genera, is generally subdivided into cereals, and pasture grasses, the former supplying nutritious food for man, the latter that for cattle.

Such specimens of the plants producing the cereal grains as have been received, will now be noticed individually. The period of inflorescence for most of these plants having passsed by, it will only be possible to examine, and describe or delineate them at that of fructification, to which they had attained, previous to their being forwarded to the Exhibition, the rice plant however is an exception to this remark, on account of the cultivation practised twice during the year, almost all over India. Samples of the rice plant in flower, and in seed, have been obtained.

Before entering into details relative to individual samples, it may not however be out of place, to give a Botanical description of the order to which these samples belong.

Dr. Balfour has the following in the last edition of his Class Book, see page 945.

Gramineæ,—the Grass order. Herbaceous plants, with round, usually hollow, jointed stems; narrow, alternate leaves, having a split sheath and often a ligule at its summit; hermaphrodite or Monœcious, or polygamous flowers, either solitary or arranged in spiked or panicled locustœ. The flowers are considered as composed of a series of bracts; the outer, called glumes, alternate, often unequal, usually 2, sometimes 1, rarely 0; the next called pales or glumells (paleæ or glumellæ), usually 2, alternate, the lower or outer one being simple, the upper or inner having 2 dorsal or lateral ribs, and supposed to be formed by 2 pales united; sometimes 1 or both are awanting. The glumes enclose either one flower as in Fox-tail grass, or more flowers, as in Wheat; and among the flowers there are frequently abortive florets. Stamens hypogynous, 1-6, usually 3; anthers versatile. Ovary superior 1-celled, with 2 (rarely 1 or 0) hypogynous scales, called lodicules; ovule 1; styles 2 or 3, rarely united; stigmas often feathery. Fruit a caryopsis, embryo lenticular, external, lying on one side at the base of farinaceous albumen. Germination endorhizal. Grasses are widely distributed, and are found in all quarters of the globe. Schouw conjectures that they constitute 1-22d of all known plants. They are usually social plants, forming herbage in temperate regions, and sometimes becoming arborescent (50 or 60 feet high) in tropical countries. There appear to be nearly 4000 known grasses. Oryza, Zizania, Zea, Coix, Alopecurus, Phleum, Holcus, Milium, Panicum, Stipa, Agrostis, Arundo, Echinaria, Cynodon, Chloris, Spartina, Hierochloe, Anthoxanthum, Aira, Arrhenatherum, Poa, Briza, Dactylis, Cynosurus, Festuca, Bromus, Bambusa, Lolium Triticum, Elymus, Hordeum, Ægilops, Nardus, Lepturus. Saccharum, Andropogon.

This is perhaps the most important order in the Vegetable Kingdom, as supplying food for man and animals. To it belong the cultivated grains, Wheat, Oats, Barley, Rye, Rice, Maize and Millet Most of these have been so long under constant cultivation that their native state is unknown. Some curious observations, however, have been lately made in regard to the native state of Wheat. The properties of the order are nutritive in a marked degree. Some yield fragrant oils, others produce sugar. The fragrant odour given out by Anthoxanthum, and other grasses used for hay, has been attributed to benzoic acid. Some as *Bromus catharticus* and *B. purgans*, were stated to have cathartic qualities, but this seems to be erroneous. Lolium temulentum, Darnel-grass, supposed to be the Tares, Zizania, of Scripture, has been said to be narcotic and poisonous, but this has not been fully proved. Some grasses, with creeping subterranean stems, as *Triticum repens*, Quick-grass, are troublesome weeds; others of a similar nature as *Elymus arenarius* and Psamma arenaria bind the loose sand of the sea-shore together. Spruce says that grasses chiefly belonging to the tribes Oryzeæ, Chlorideæ, and Paniceæ, constitute the mass of the numerous floating Islands in the Amazon, called Ilhas de Capem. These Islands are sometimes acres in extent, and from 5 to 8 feet of their thickness is under water. The hollow stems of some tropical Grasses contain a cool fluid which supplies a refreshing drink. The cuticle of Grasses is silicious.

The European grains, belonging to this order require no notice here, as the object is not to enlarge on what is generally known, but to endeavour to direct attention to those members of this order which are chiefly grown within the Tropics, are less known, and of which samples have been sent in. A few passing remarks however, on the samples of Wheat and Barley exhibited, appear to be called for, before the more peculiarly Tropical grains are considered.

The number of samples of wheat received from the various contributors was 24, the best appears to be that forwarded by the Local Committee of Bellary, good samples have also been received from Coimbatore and Masulipatam. Mr. McIvor has forwarded a very excellent specimen of Barley grown on the Neilgherry hills.

Regarding the samples as a whole, the grains under remark are inferior to those grown in Europe, neither the ears, nor the husked grains being so large or full, as those raised there; nevertheless, the various attempts to cultivate in an Indian climate, such valuable grasses, is deserving of all praise.

The whole series of Drawings contained in this Report, have been taken from specimens of plants forwarded to the Exhibition, and have been executed by Mooroogasen Moodelliar, Draughtsman to the Madras Medical College.

PLATE I.

ORYZA SATIVA, *L.*
RICE, *Eng.*
DHAN, *Hind.*
BEEYUM, *Tel.*
ARESEE, *Tam.*

Fig. 1. Rice plant, showing the fibrous roots ; culms numerous, jointed, round and smooth, from 2 to 8 or 10 feet long ; leaves sheathing, long and slender, backwardly scabrous, mouth of the sheath crowned with ligula ; Panicle terminal, thin, bowing when the seed is weighty.
Fig. 2. Flower.
,, 3. Stamens.
,, 4. Stamen
,, 5. Ovary with its two headed stigma.
Figs. 2, 3, 4, 5 magnified.

PLATE II.

ELEUSINE CORACANA, *Gartn.*
RAGEE, *Eng.*
NATCHANEE, *Hind.*
PONASSA OR SODEE, *Tel.*
KAYVAROO, *Tam.*

Fig. 1. An erect culm supporting spikes (of *E. Corcana*) from 4 to 6, digitate, incurvate, from 1 to 3 inches long, composed of 2 rows of sessile spikelets, each consisting of 3 to 6 flowers.
,, 2. Rachis with caryopsis, encompassed with glumes.
,, 3. Calyx formed of 2 Glumes.
,, 4. Seed covered with a thin, pellucid, membranaceous aril.
,, 5. Seed denuded of the aril.
Figs. 2, 3, 4 and 5 magnified.

PLATE III.

PENICILLARIA SPICATA, *Swz.*
SPIKED MILLET, *Eng.*
KUMBOO, *Tam.*
BAJREE, *Hind.*

Fig. 1. Terminal spike-cylindric, erect, as thick as a man's thumb, from 6 to 9 inches long.
,, 2. Pedicel with Caryopsis surrounded with many woolly hispid purple hairs.
,, 3. Caryopsis covered with 2 valved calyx formed by glumes.
,, 4. Seed, obovate, pearl coloured, smooth, with hilum.
Figs. 2, 3 and 4 magnified.

PLATE IV

SORGHUM VULGARE, *Pers.*
GREAT MILLET, *Eng.*
JOWAR, *Hind.*
JANOO, *Tel.*
CHOLUM, *Tam.*

Fig. 1. Showing the Panicle of *S. Vulgare* contracted, very dense.
,, 2. Peduncle with its pedicels supporting the Seeds.
,, 3. Flower with its numerous woolly glumes and long Stigma.
,, 4. Calyx of glumes.
,, 5. Ovary with its long and single stigma.
,, 6. Stamens.
Figs. 2, 3, 4, 5 and 6 magnified.

PLATE V.

SORGHUM VULGARE.

This is only a variety of the former and is called YERRA JANOO (red), in *Teloogoo.*

Fig. 1. Panicle rather loose.
,, 2. Peduncle with its pedicels supporting seeds covered in woolly glumes.
,, 3. Calyx.
,, 4. Seed.
Figs. 2, 3 and 4 magnified.

PLATE, I.

ORYZA SATIVA . L.

ARISEE_ TAM. CHAWL _HIND. BEEUM _TEL.

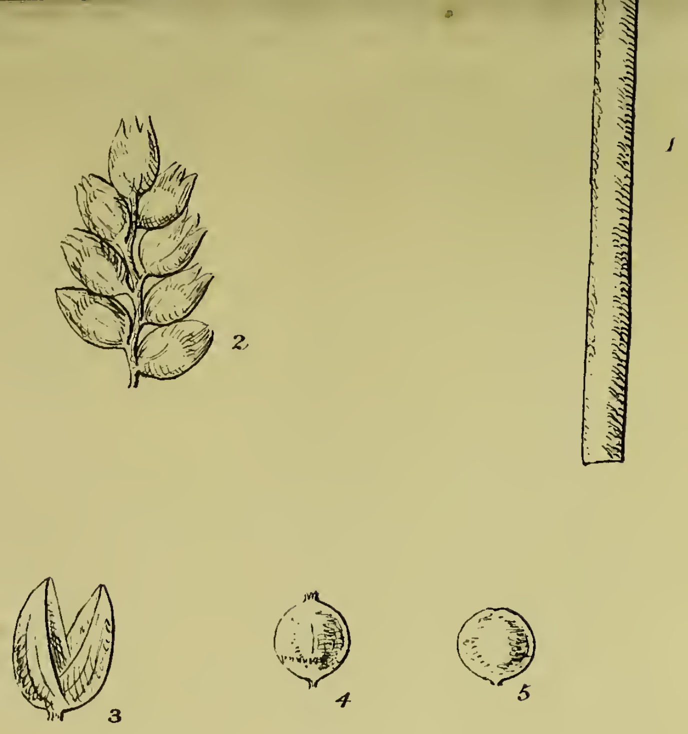
TRANSFER BY. P. N. CHATELIER.

Fort St George, 15 April, 1858.

J. Dumphy Supt & Mangr. }
Govt. Lithc. Press D.P.W. }

(True Copy) E. Lawford Major.
Supg. Engineer S. Circle }
In charge of Central Office P.W. }

PLATE. II.



ELEUSINE CORACANA, G.

KAYVAROO, TAM. RAGGEE, HIND. PONASSA, TEL.

TRANSFER BY P. M. CHATELIER.

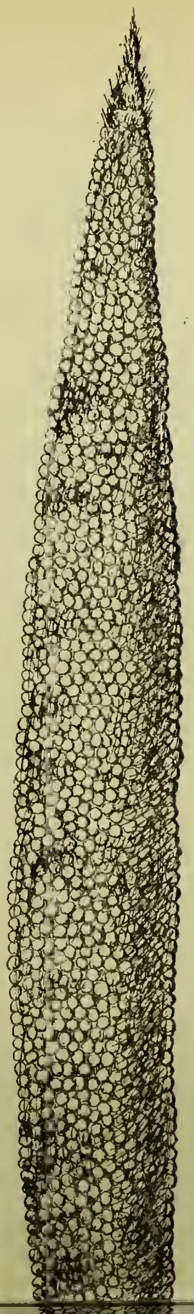
J. Dumphy Supt. & Mangr. Govt. Lithc. Press D.P.W.

P. MOOROOGASEN. DELT.

Fort St. George. 23 April 1858.

(True Copy) W. E. Faber. Colonel. Chief Engineer.

PLATE III.



PENICILLARIA SPICATA. WILLD.

KUMBOO, TAM. BUJERA, HIND. GANTILOO, TEL.

Drawn by T. Dent.

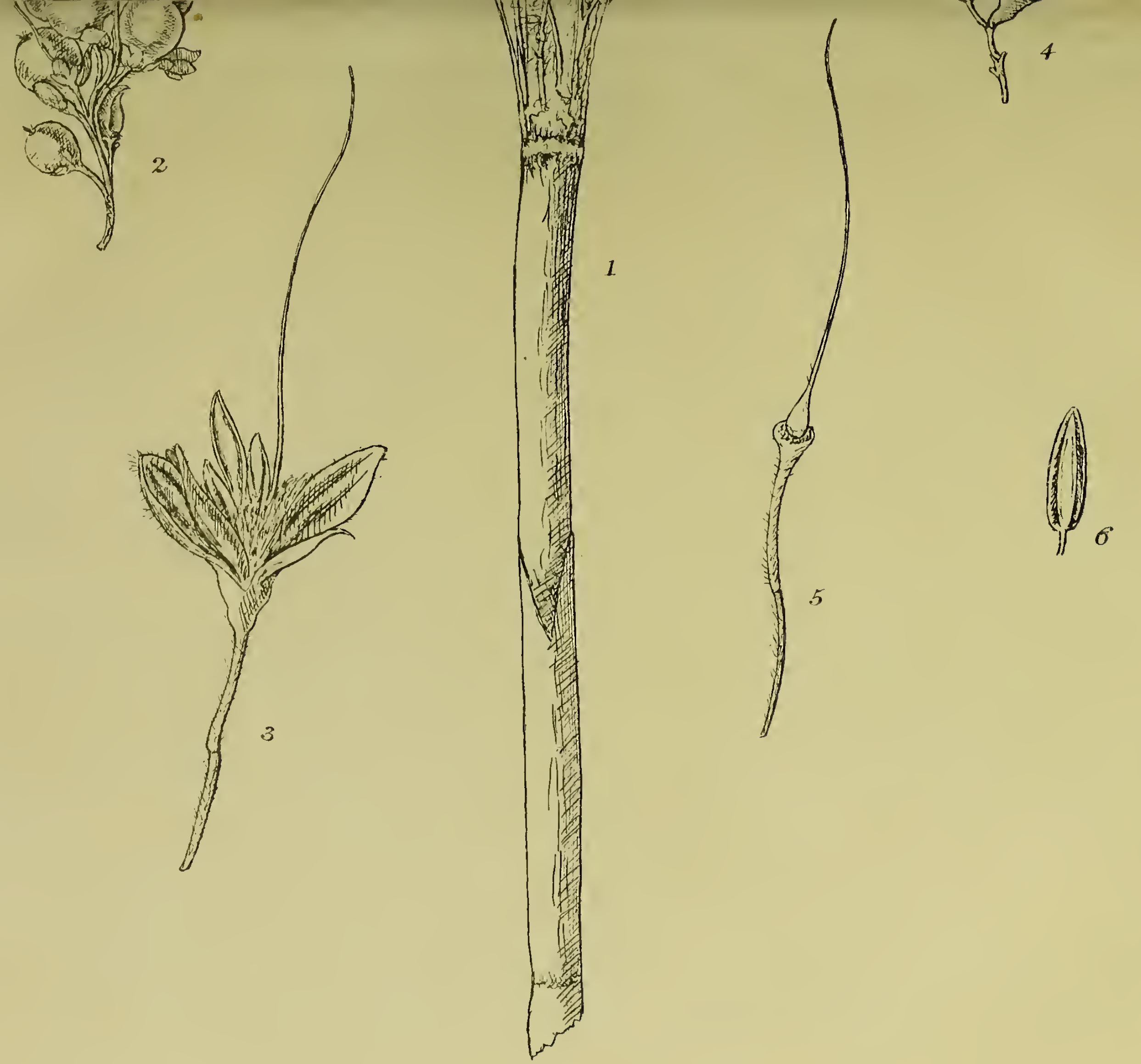
Fort St. George, June 1858.

/True Copy/ C. Sawford Major
Supt. Engr. S. Circle,
In charge of Central Office of P.W.

J. Dumphy Supt. and Mangr.
Govt. Lithc. Press, D.P.W.

T. Mooroogasen, Delt.

PLATE. IV.



SORGHUM VULGARE.

WHITE CHOLUM.

TRANSFER BY P. M. CHATELIER.

Drumphy Supt. & Many.r Govt. Lith.c Press D.P.W.

Fort St. George 3d May 1858.

(True Copy) [signature] Colonel Chief Engineer

P. MOONOOSAMY. DEL.T

PLATE. V.

SORGHUM VULGARE, VAR.

BLACK CHOLUM.

TRANSFER BY P. M. CHATELIER.

Fort St George 11 May /58.

Dumphy Supt. & Mangr.
Govt. Lithc. Press D.P.W.

P. MOUROOGASEN. DELT.

(True Copy) [signature] Colonel
Chief Engineer

PLATE. VI.

SORGHUM VULGARE VAR.

ANDROPOGON SACCHARATUS. ROX. SHĀLU,

Dumphy Supt. and Mangr. Govt. Lithc. Press. D.P.W.

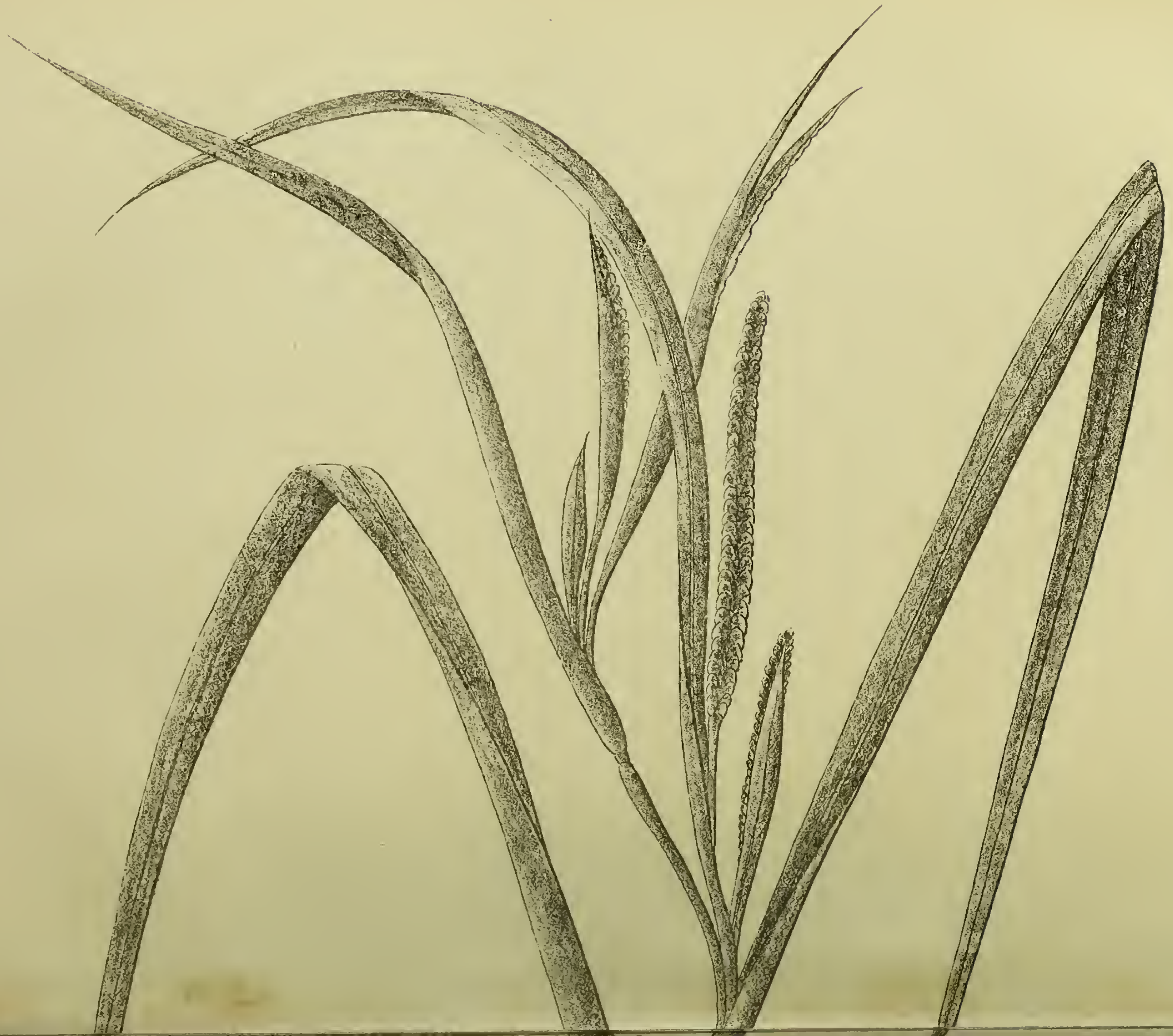
P. Mooroogasen Delt.

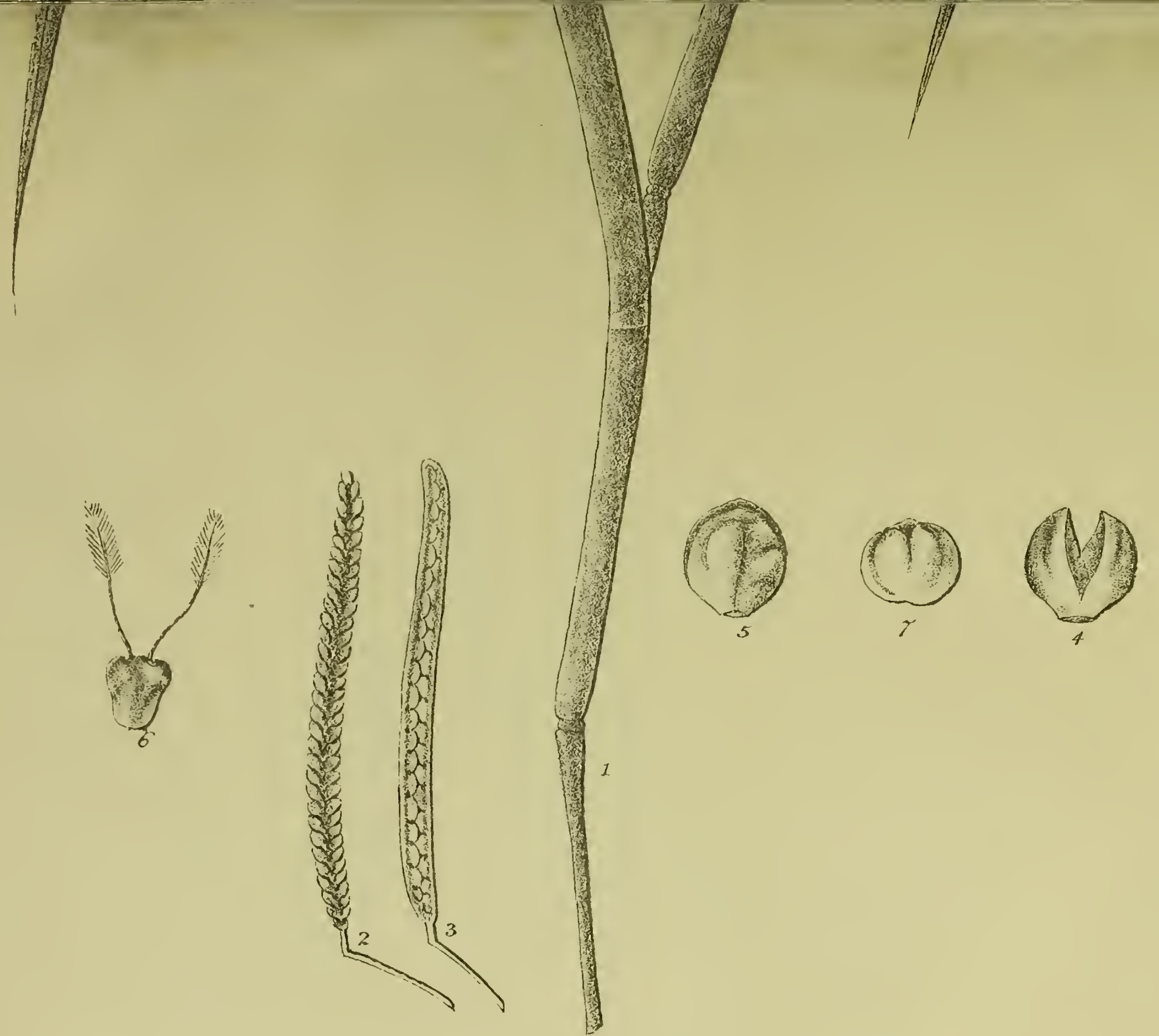
True Copy. [signature] Colonel.... Chief Engineer D.P.W.

TRANSFER BY T. DENT.

Fort St. George: May 1858.

PLATE, VIII.





PANICUM MILIACEUM, WILLD.
WARAGOO, TAM. CHEENA, HIND. WORGA, TEL.

TRANSFER BY P.M. CHATELIER.

Fort St. George, 8 April 1858.

J. Dumphy Supt. & Many.
Govt. Lithc. Press D.P.W.

F. MOOROOGASEN, DEL.

True Copy) Sawford Major.
Supd. Engineer S. Circle.
In charge of Central Office P.W.

PLATE IX.

PANICUM MILIARE.

SHAMAY TAM:

DRAWN BY G. WINCHESTER

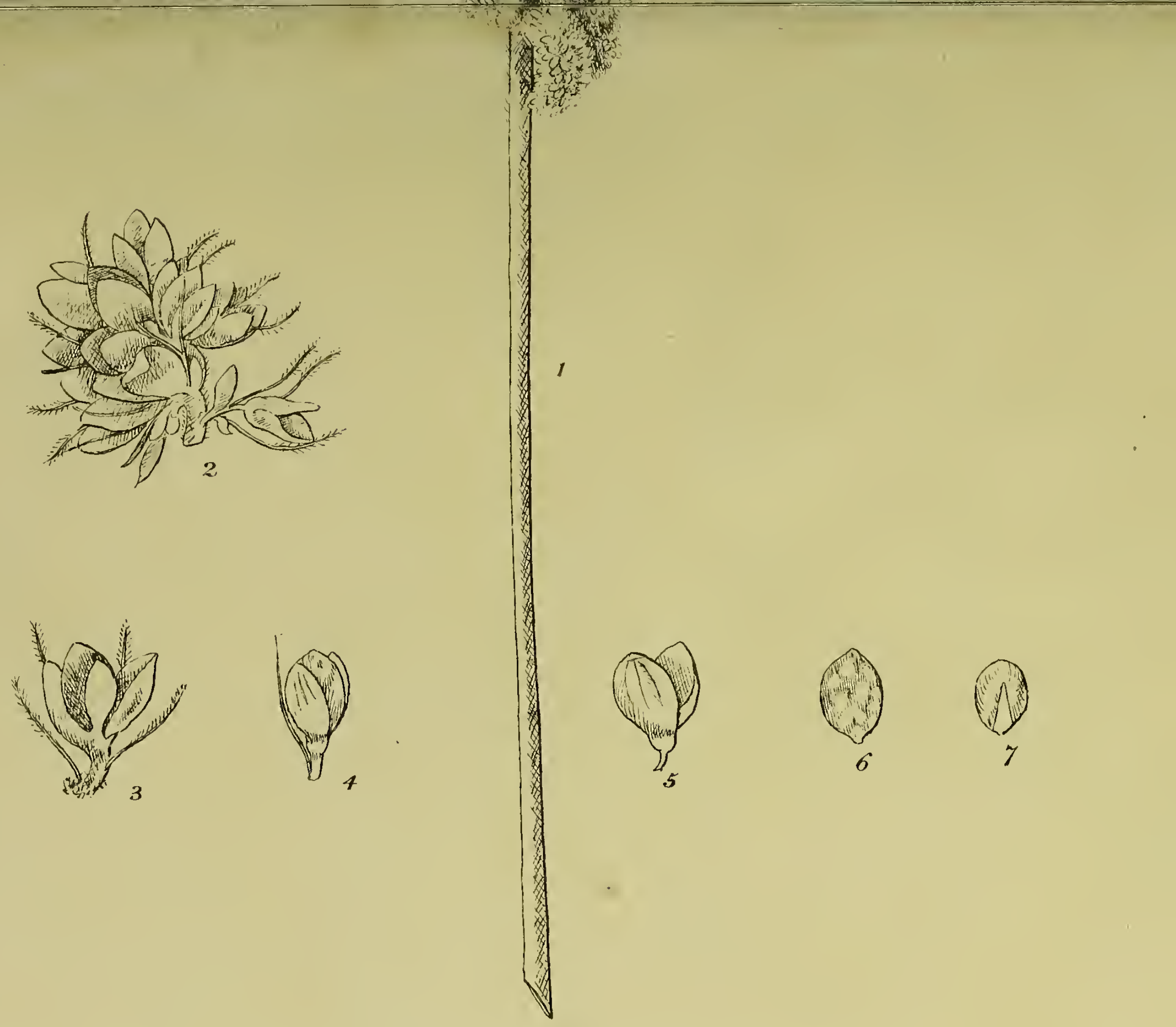
J. Dumphy Supt. and Mangr.
Govt. Litho Press, D.P.W.

True copy, [signature] Colonel.
Chief Engineer D.P.W.

Fort Saint George 14th May 1858.

P. MUCKOOO & SEN. DELT.

PLATE. X.



PANICUM FRUMENTACEUM, ROX.

TRANSFER BY, P.M. CHATELIER.

J. Murphy Supt. & Mangr. Govt. Lithc. Press D.P.W

P. MOUROUGASEN. DELT.

Fort St. George, 27 April/58.

(True Copy) [signature] Colonel. Chief Engineer

PLATE VI.

SORGHUM SACCHARATUM.

ANDROPOGON SACCHARTUS,	*Roxb.*
DEODHAN,	*Hind.*

Erect, panicles verticillate; calyx hairy; corolla awnless; roots ramous; culms erect, round jointed; leaves sheathing, sword shaped; flowers paired, one hermaphrodite, the other neuter.

Grows in cold season on land too high for rice.

Fig. 1. Panicle nat: size.
,, 2. Branchlet.
,, 3. Flower opened.
,, 4. Caryopsis with covering.
Figs. 2, 3 and 4 magnified.

PLATE VII.

PANICUM ITALICUM,	*L.*
ITALIAN MILLET,	*Eng.*
KORA,	*Hind.*
CORALOO,	*Tel.*
TENNEY,	*Tam.*

Fig. 1. Culms erect, from 3 to 5 feet high, round, smooth; leaves sheating; spikes nodding.
,, 2. Spikelet—the pedicels having 2 or 3 flowers with smooth bristles intermixed.
,, 3, 4. Glumes with bristles.
,, 5. Seed, ovate.
,, 6. Seed.
Figs. 2, 3, 4, 5 and 6 magnified.

PLATE VIII.

PANICUM MILIACEUM

LITTLE MILLET,	*Eng.*
WARAGOO,	*Tam.*
CHEENA,	*Hind.*
WARGA,	*Tel.*

PLATE. IX.

PANICUM MILIARE,	*Lam.*
NELLA SHAMA,	*Tel.*
SHAMA,	*Tam.*

Culms erect, ramous, 2 to 3 feet high, smooth; flowers paired on a common pedicel, with unequal partial pedicels; Corolla three valved, seed ovate, smooth, fine streaked; panicle oblong, beautifully bowing with the weight of the grain; glumes of the calyces striated.

Fig. 1. Culm with waving panicle.
,, 2. Spikelet.
,, 3. Seed with glumes.
,, 4. Seed.

PLATE X.

PANICUM FRUMENTACEUM,	*Rox.*
BONTA-SHAMA.	*Tel.*

Culms erect, 2 to 4 feet high; panicle erect; spikes secund, incurved; flowers three fold unequally pedicelled; leaves large, margins hispid.

Grown in dry rich soil.

Fig. 1.
,, 2.
,, 3.
,, 4.
,, 5.
,, 6. } Seed.
,, 7. }

A most able review of the Grass tribe, in almost all its important relations, is to be found in a work written by the late J. O. Voigt, Surgeon to the Danish Government Serampore, this work was published by the late W. Griffith, under the title of Hortus Suburbanus Calcuttensis. The portion I have extracted, not only furnishes much important information, but appears particularly appropriate to the subject, which it has been the object of this paper to illustrate. I shall, therefore, have no hesitation in making free use of Dr. Voigt's work, especially as the Geography of the grasses is chiefly taken from the papers published by Schow, Brown, Griffith, Wight, Royle, and others.

THE GRASS TRIBE.

This order is exceedingly numerous, and likely to increase in a larger ratio than the other phœnogamous plants, so that the future proportion of grasses to the rest of Endogens will perhaps be as 1 to 20, or even perhaps as 1 to 16. Among the grasses, there are both land and water-plants, but no marine ones. They occur in every soil, in society with others or alone, the latter in such abundance, as entirely to occupy considerable districts. Sand appears to be less favourable to them, but even this has species nearly peculiar to itself. The diffusion of the order has almost no other limits than those of the whole vegetable kingdom. Species of it have been discovered on Spitzbergen, on the mountains of S. Europe, nearly to the snow-line, and on the Andes. The tropical grasses differ from the extra-tropical ones, by their greater size, some (F. ex. the bamboos) being 50-60 feet high by their larger leaves ; by their frequently separate sexes, and lastly by their softer, more downy, and elegant flowers. The extra-tropical grasses on the contrary, far surpass the tropical ones in the number of individuals. That compact grassy turf, which especially in the milder parts of the temperate Zones, in spring, and summer composes the green meadows and pastures, is almost entirely wanting in the torrid zone. The grasses here do not grow crowded together, but, like other plants more dispersed. Even in the Southern parts of Europe, the assimilation to the warmer regions, in this respect, is by no means inconsiderable. *Donax arundinaceus*, by its height, reminds us of the Bamboo, while *Saccharum Revenna*, *S. Teneriffæ*, *Imperat arundinacea*, *Lagurus ovata*, *Lygeum Spartum*, and the species of *Andropogon*, *Ægilops*, &c., by their separate sexes exhibit tropical characters. The grasses are also less gregarious, and meadows occur seldomer in the south than in the north of Europe. (Extract from Schouw in Jameson's Philos: journ:, April 1825, copied by Lindl.

What may be the amount of Indian species of grasses hitherto discovered, it is impossible for us to state, Nees von Esenbeck's synopsis of Wight's and Royle's grasses not being procurable, and those enumerated in Wall. Cat. still remaining in the hands of R Brown. Supposing, however, the aggregate of the former to be 200, and the latter, after abstracting common forms, to amount to 100, the sum total of discovered Indian grasses will, on reducing Griffith's gramineous collections, probably be about 1300. The collections stand thus.

Griffith, 270 from Affganisthan ; 150 from the Peninsula of India ; 128 from the Khassya mountains ; 100 from Assam, 100 from Serampore ; 93 from Mergui ; 73 from the Mishmee Hills ; and 51 from Bhootan. In all 965, but after abstracting common forms, perhaps 800.

Roxb :—217.—Royle—and Wight—200 ? Wall. Cat, 131, reducible perhaps to 100.

As the Indian tropical grasses are abundant, and large in foliage, so do the species which extend along the foot of the Himalyas, form a grass jungle sufficiently high to conceal the elephant and rhinoceros, while in ascending, we find many of the same genera and species, which are met with in proceeding from the equator to the poles. The grasses found in the plains of India, some of which are confined to the Peninsula, but many of which are as common in the northern as in the southern plants, belong to genera, of some of which a few species ascend the mountains, and are found there at considerable elevations in the rainy season of the year. The majority of these genera are Asiatic, and the greater number of their species are contained in, and some of them confined to India; but some of the genera are as characteristic of the floras of America, New Holland, and Africa. In the plains of N. India there are a few species likewise found in European Countries, or which belong to genera more like European than Indian forms ; *f. ex.* the common Doob grass (*Cynodon Dactylon*) among the Cold weather cultivation of wheat and barley, two European species are very commonly found, viz. *Lolium temulentum* is (the only grass in its normal state of a deleterious nature), and *Avena fatua*, L. Though many of the Gramineæ found in the Himalayas belong to genera of which the greater number of species inhabit tropical situations, yet it is only in the rainy season that these occur, and the mass of the grasses, like that of the vegetation in general of these mountains, will be found to be analogous to that of European countries ; and many of those very species which are most valued as pasture grasses in England, are found forming the grassy sward of the Himalayas. The plains of India being subject to great heat, with drought at one season, and heavy rains at another, cannot be expected to present any pasture grounds resembling those of the best parts of Europe ; but the temperature of the cold weather months, especially in the northern provinces, being such as to be most favourable for the cultivation of the same cereal grasses as in Europe, it is not surprising that good grass is produced there, and that many Eu-

ropeans prepare very excellent hay. Their rapid growth, great height, and subsequent dryness render many of the Indian grasses unfit for pasture, at the end of the year. This the inhabitants of the tracts at the base of the Himalayas, as well as those within these mountains, remedy by yearly burning down the old and dry grass, so as to allow the young blades, which immediately sprout up, to afford fodder for the cattle. But most Europeans in India prefer, or indeed only give their horses, the creeping stems and leaves of the *Dooba grass*, which is by far the most common in every part of India, and moreover flowers through the greater part of the year. In N. India, it is a common practice to form lawns and pasture of moderate extent, by planting pieces of the creeping stems of this grass, which yields excellent hay in what is the spring of the year in Europe. It forms indeed three-fourths of the food of the horses and cows in the south of India. (*Royle, ill. p.* 415-21.) Cattle are also fed on the grass, whether green or dry, of *Kodu* (Paspalum scrobiculatum, L.); *Chena-ghas* (Panicum miliaceum, Wild.); *Jalgantea* (Panicum Helopus Trin.); *Kungoo Panicum miliare* (Panicum italicum L.); *Burogab-gantea* (Panicum setigerum, Retz.); *Chhoto-jalgautee* (Panicum repens, Roxb.); *Shama* (Panicum colonum, L.); *Damra shama* (Panicum frumentaceum, Roxb.); *Bajura* (Penicillaria spicata, Willd.); *Jooar* (Sorghum vulgare, Pers.); *Sorghum cernuum*, Willd); S. *saccharatum*, Pers. Roxb.); *Makurjalee* (Panicum ciliare, Retz.); *Kash*. Saccharum spontaneum, L.); *Andropogon* Martini, Roxb.; *Buksa* Rottbollia glabra, Roxb.); *Juva*, (Hordeum hexastichon, L.,) &c.

The prevalence of particular grains in the zones and continents depends not only on climate, but is determined also by the civilization, industry and traffic of the people, and often by historical events, thus the earth may, according to Schouw, be divided into five grand tracts, distinguished by the prevalence of barley and oats, rye, wheat, maize or rice. *The two first* extend farthest to the north in Europe, constituting in the northern parts of Norway and Sweden, and in a part of Siberia and. Scotland, the principal vegetable nourishment Rye is the prevailing grain in the South of Norway and Sweden, in part of Siberia, in Denmark, and all the countries bordering on the Baltic. In the latter, another very nutritious grain, *Buckwheat*, is very frequently cultivated The rye tract is generally associated with the cultivation of wheat, barley there being chiefly cultivated for the manufacture of beer, and oats for supplying food for horses. The *wheat* tract comprehends the middle or the south of France, England, part of Scotland and Germany, Hungary, the Crimea and Caucasus, as also the lands of middle Asia, where agriculture is followed. The next tract, where wheat still abounds, but no longer exclusively furnishes bread, maize and rice becoming frequent, includes Portugal, Spain, part of Mediterranean, France, Italy, Greece, the Canaries, Barbary, Egypt, Nubia, Arabia, Persia and N. India. In China and Japan rice is found to predominate. The cause of this difference between the east and the west of the old continent appears to be in the manners and peculiarities of the people. In N. America, wheat and rye grow as in Europe, but more sparingly. Maize is more reared in the new than in the old continent, and rice predominates in the southern provinces of the United States. In the torrid zone, *Maize* predominates in America, *Rice* in Asia, and both these grains in nearly the same ratio in Africa. The cause of this distribution is, without doubt, historical; for Asia is the native country of rice, and America of maize. In some situations, especially in the neighbourhood of the tropics, wheat is also met with, but always subordinate to maize and rice. In the high lands of South America, maize grows to the height of 7,200 feet above the level of the Sea, but only predominates between 3,000 and 6,000 f. of elevation. Below 3,000 it is associated with yams, manihot, batatas, and plantains; while, from 6,000 to 9,260, the European grains abound, wheat in the lower regions, and rye and barley in the higher, along with which Chenopodium Quino, *Willd.* as a nutritious plant must also be mentioned. Potatoes alone are cultivated from 9,260 to 12,300 feet. In the torrid zone in Africa, plantains, manihot, yams, Arachis, hypogea, L. and Sorghum Vulgare Pers, are added to the maize and rice. To the south of the Capricorn f. ex. in S. Brazil. Buenos Ayres, Chili, C. G. H. and the temperate zone of New Holland, wheat predominates, barley however, and rye, make their appearance in the southernmost parts of these countries, and in Van Dieman's Land, and in New Zealand, the European grains are now cultivated with success. In the Islands of the South Sea, grain of every kind disappears, its place being supplied by the Bread-fruit-tree, the Plantain and Tacca pinnatifida, Forest, Tropical New Holland exhibits no agriculture, the inhabitants living on the produce (Sago) of various palms and species of Arum.

In concluding the Botanical Section of the present Report without having noticed any other natural order than that of the Grasses, some apology appears to be called for. The best that I can offer will be found in the very partial and imperfect notice of the one order I have attempted to illustrate. To have treated of this one as its importance merits, a much larger amount of time, and far more extended opportunities for observing the few specimens which have been delineated during the stages of Germination, Infloresence and Fructification, would have been requisite. The want of this necessary time and opportunity has permitted but of the very imperfect notice bestowed on each grass. Under such circumstances to have attempt-

ed any thing in reference to another order of plants would have been utterly futile. I however indulge the hope that on future occasions, the various natural orders to which articles of Food in India belong will year by year, and from abler hands receive that attention, which their great and general utility demands.

SECTION III.

Culture in India of the Plants used as food.

Without describing separately the agricultural processes employed in this part of the world, it may truly be affirmed that all are purely empirical. The cultivators do all that they do, merely because their forefathers did so before them, they know absolutely nothing of the reasons why this or that process is beneficial, or why the other should be avoided, nor can this be wondered at, when we consider that without a knowledge of Vegetable Physiology and Chemistry, it is not possible for any one to give a sound or rational explanation of his reasons for choosing one soil for this plant, and another for that. That the knowledge required to enable the cultivator to select correctly embraces a somewhat extended circle, can readily be approved since he must understand something of the laws of pure Physics, otherwise he will not be able to comprehend the attractions between surfaces and fluids, and especially that form of this force generally termed capillary attraction, on which the circulation of the sap in plants so largely depends, nor will he comprehend the penetration of membranes in one direction and not in another by this fluid and not by that, unless he has made himself acquainted with the Laws of Endosmosis and Exosmosis, nor will he understand by what agency the organisms of different plants, according to the formation and nature stamped upon them in the beginning by Almighty Wisdom, have power to appropriate this atom of a compound, while they give out that, to attain such knowledge he must have studied the laws of Galvanism, and especially the effects of feeble saline solutions of different characters, on opposite sides of membranes, he must know how potent their decomposing effects in time, though how imperceptible (except to very delicate instruments) at any given moment. In one word he must understand Vegetable Physiology. To which he must add, a sound knowledge of Inorganic and Organic Chemistry. Since in order to select his soil correctly, he must be able to examine chemically the soil in question and further his examination to be of any value, must be a quantitative one, that is to say he must be able to ascertain the relative proportions in which the constituents found in the soil are present, he must further ascertain how deep the soil may be before it merges into the subsoil, or that which has not been exposed to the influences of sun, heat and light, and to those of the air, moisture, &c. Again he must ascertain of the true soil what portions are soluble in water, and what are not soluble, in other words he must inform himself of the proportion of the soil that is in a condition to be taken up by the spongioles of the roots of the plant. When this examination has been completed, the cultivator must ascertain, whether the inorganic constituents of the ash of the plant he intends to cultivate on the soil examined, are such as to prove that such plant can readily obtain from the soluble portion of the soil such inorganic constituents as the plant requires to form the feeble saline solutions of different chemical characters, already spoken of, and by the agency of which, on opposite sides of membranes, the imperceptible Galvanic actions by which one atom of (perhaps) Oxygen is set free, while one atom perhaps of Carbon or Hydrogen is appropriated.

The Sunheat and light exalting all chemical affinities, act as powerful auxillaries to these actions, on which depend not only the yearly circles of new wood in Endogenous plants, but the formation of the numberless Acids, Oils, Fats, Resins, Sugars, Gums, Starches, neutral bodies, &c. &c. that are abundantly obtained from an endless diversity of plants. A few illustrations of these actions will help to render this part of the subject more generally intelligible.

The deposition of Lignin or in other words, the conversion of a part of the atmosphere into solid wood is not the least wonderful or interesting, yet throughout the whole globe, excepting the Frozen regions and Sandy Deserts, in fact in every spot where the appropriate inorganic constituents can be readily obtained by the plants referred to, this conversion is silently taking place, and if we think of the numerous forests still standing, on the grandest scale.

Analysis has informed the Chemist that pure Lignin (i. e. wood, without the saline constituents, sap or secretions,) consists of 3 elementary substances linked together in the following proportions :

Carbon 12 parts, Hydrogen 10 parts, Oxygen 10 parts. The Question naturally arises, Whence are these three bodies obtained ? Accurate observation and experiment have answered this question, and proved that they are derived from water and Carbonic acid, the latter obtained in chief part from the air, the former both from the air and from the earth. The solid then from which our ships, the beams of our houses &c. &c. are made, is obtained from a Fluid and a Gas by the silent agencies of vegetable organisms. How this marvellous conversion may be effected will be seen from the following considerations. The atmosphere in all parts of the world contains Carbonic Acid Gas, and moisture or water, and the constitution of the Gas is accurately known, viz. one Atom or Equivalent of Carbon united with two atoms of Oxygen. The con-

stitution of water is also well known; it is a compound of one Equivalent or Atom of Hydrogen with one Atom of Oxygen. In addition to a knowledge of the compounds from which the Lignin is obtained, and their chemical constitution, we know that of pure Lignin itself, we also know that in health and especially under the influence of sunshine, plants take in by means of the stomata of their leaves Carbonic Acid, and give out Oxygen. Numerous Experiments made by different observers have proved that this is the fact, we know then, the action of the plant; and this gives us the key to the mystery. We may even represent it by figures in the following way. 12 Atoms of Carbonic Acid taken in by the plant, 10 Atoms of Water taken in added together give a total of Atoms taken in Carbon = 12, Oxygen 24, Carbonic Acid.

Hydrogen 10	Do.	10 Water.		
Total Atoms	H 10	C 12	Oxy. 34	taken in.
but we find the composition of Lignin to be	H 10	C 12	Oxy. 10	Lignin.
			Oxy. 24	given off,

which is in accordance with the action of the plant; therefore we have no longer any difficulty in understanding the actions by which Water and Carbonic Acid can be, and are converted in the living Organisms of plants into solid wood; here it may be asked what has all this to do with the culture of these wood forming plants? the answer is precise; these actions cannot take, place unless the wood-forming plants can find a free supply of those mineral constituents in the soil, which are required to bring the circulating fluids of the plant into the condition fitted to set up the feeble continuous Galvanic actions, to which allusion has already been made, and without which, sunheat, and light, no decomposition of the Gas, nor the fixation of its Carbon, nor the evolution of its Oxygen can take place.

I have been led by the current of the foregoing remarks to give as the first illustration of the actions referred to, the formation of Ligneous fibre or wood. The simpler illustration would have been the formation of the Organic Acids which take place, under conditions precisely similar to those already described, and to which should be added the presence of Albumen in the cells, and a free supply of water, in which Carbonic Acid is dissolved; the first is indispensable, since no cell can exist without it, and it is likewise susceptible of certain decompositions under the united influence of temperature, and moisture, which give rise to many important transformations: without water, none of the mineral constituents so important to the healthy actions of the plant can be taken up, or circulate either by capillary action through tubes, or by endosmosis through vegetable membranes by means of water. Alkalies, Phosphates, and a variety of inorganic salts, as well as free Carbonic acid, are rendered soluble, which is of the greatest importance in facilitating Chemical action, as the opposite atoms are thereby allowed to come into contact, or so near as to be within the sphere of that form of insensible attraction, known as Chemical affinity. These actions being set up in the peculiar cell apparatus of the plant, may be regarded as a feeble kind of Galvanic arrangement, which is constant during sunheat and light. By this recapitulation of the forces, conditions, and arrangements needed to produce the wonderful results arrived at; I have sought to give prominence to the facts, and thus to fix them in the mind. Their simplest illustration is as before stated, to be found in the formation of the vegetable acids, and the simplest in chemical constitution of all these acids is Oxalic, its Formula being C_2 O_3 (in the dry state), now two equivalents of Carbonic Acid being taken into the Organism of the plant, are equal to the Formula C_2 O_4, the action of the plant is to give out Oxygen under the influence of sun light, and by this influence one equivalent of Oxygen is given out, while the C_2 O_3 left, are united to one equivalent of water, thus arriving at the ordinary Formula of Oxalic Acid viz. C_2 O_3, H O. in the crystalized state, as the Acid is found in the Shops, the Formula is, C_2 O_3, H O + 2 HO. i.e. 2 Equivalents more of water are required, to enable the Acid to assume the form of crystals.

In like manner, all Organic Acids, composed only of Carbon, Hydrogen and Oxygen are formed. Malic, Tartaric, and Citric will sufficiently prove this.

8 Equivalents of Carbonic Acid	=	C_8 ,, O_{16}
6 Do. of Water	=	H_6 O_6
Total of Atoms employed, or		C_8 H_6 O_{22}
taken in by the plant, given out under the influence of sun light...		O_{12}
Empirical Form: of Malic Acid		C_8 H_6 O_{10}

Written to shew the water of Hydration the Formula will be C_8 H_4 O_8 + 2 HO.

8 Equivalents of Carbonic Acid	=	C_8 ,, O_6
6 Do. Water.........	=	H_6 O_6
Total of Atoms employed...		C_8 H_6 O_{22}
Atoms given out.........	=	O_{10}
Emperical Formula of Tartaric Acid		C_8 H_6 O_{12}

Writen to shew water of Hydration
C_8 H_4 O_{10} + 2 HO.

12 Equivalents of Carbonic Acid	=	C_{12} ,, O_{24}
8 Do. Water.........	=	H_8 O_8
Total Atoms employed.........		C_{12} H_8 O_{32}
Atoms given out..........		O_{18}
Emperical Formula for Citric Acid		C_{12} H_8 O_{14}

Written to shew the water of Hydration. C_{12} H_5 O_{11} + 3 HO.

Next in simplicity of formation is the group of substances of which Lignin is a member, it includes the Starches, Sugars, Gums, all which are formed in the same way as Lignin or wood. All these substances have an extraordinary capability of being metamorphosed one into the other, always bearing in mind that this capability of conversion is always in one direction i.e. from organized to unorganized substances; thus, Starch and Lignin are organized substances, and they can be converted in the Laboratory into Gum and Sugar, which are unorganized, but Gum and Sugar cannot be artificially converted into Starch or Lignin : again, these substances, are constantly being formed in plants by metamorphosis from other substances ; thus, in the plantain we find in the first instance little more than Starch, and a little fine woody fibre, (Lignin), as the fruit ripens under culture, we find an abundance of Sugar, and a small amount of Acid, and, finally, if the fruit be allowed to become too ripe, we find a trace of Alcohol present, the same changes are evident in the pear and other fruits : some of these metamorphosis we have the power of imitating in the laboratory. We cannot at present change the acid into sugar, but we can change Starch into Sugar, and Sugar into Alcohol, and we can readily shew experimentally that all these substances are composed of Carbon, Hydrogen and Oxygen ; by combustion in an appropriate apparatus, we can obtain from them Carbonic Acid Gas and water, and the weights of the water with that of the Carbon deduced by calculation from the weight of Carbonic Acid found by experiment, added to the weight of inorganic ingredients found by combustion also, give the weight of the original substance ; finally we can shew in the simplest way, that all of them contain Carbon. Strong Sulphuric Acid poured on Sugar, Gum, Lignin or Starch, by* abstracting the Hydrogen and Oxygen present, leave the Carbon ; with white Sugar or Starch placed in a wine glass, this experiment gives very beautiful and striking results. Any of the Organic Acids can be made to display directly or indirectly their Carbon, for with a few exceptions either of them heated *per se* &c. in a platinum dish, will shew an escape of watery vapour, and a residue of Charcoal ; or if heated with a Caustic Alkali, will give the *Carbonate* of Potash or Soda ; finally, the source of all these combinations of Carbon (Carbonic Acid Gas) may be made to display its Carbon, since if the Gas be passed dry over Potassium or Sodium placed in a bulb tube, the metal will become oxidized, while the Carbon in *black grains* will be deposited inside the tube, or on parts of the Metallic oxide. Thus we have most complete and convincing series of proofs of what is taking place during the culture of plants, and what further increases the importance and value of these laws is, that they have a most extended application, that is, to all substances composed only of Carbon, Hydrogen, and Oxygen ; besides the Organic Acids formed in fruits, and the starch and sugar groups, there are various bodies such as bitters, coloring matters, &c , which are all formed in the manner just described. An example or two of this class of bodies will suffice.

Salicine has the formula C_{20} H_{18} O_{14}, therefore it must have been formed, by means of 20 Equivalents of Carbonic acid, and 18 of water, giving a total of atoms = C_{20} O_{40}

Water............		H_{18} O_{18}
		C_{20} H_{18} O_{58}
Oxygen give out.....	....	O_{44}
Salicine left..........		C_{20} H_{18} O_{14}

The Alkaloid of Quassia, Quassine, Form. C_{20} H_{12} O_4. To form it the plants must have taken up 20 Equivalents of Carbonic acid, and 12 of water, and given out 46 of Oxygen.

Again, the Group of Fragrant Volatile Oils, such as oil of Anise, Cumin, Cinnamon, &c. are formed in this way, their respective acids being obtained by the addition 2 of Oxygen to the Formula for the parent oil, nor is this Group the last that comes under the power of those actions by which Carbonic acid and water are converted into such immense variety of solids and fluids. The Group of Ethers and the acids derived from them, as well as a host of fatty acids, are all included under the operation of the same laws, thus Oxide of Ethyle, or common Ether is obtained by the abstraction of one equivalent of water from alcohol, which is obtained from sugar in solution by the action of a ferment at a certain temperature. One equivalent of sugar furnishes 2 equivalents of alcohol, and 4 of Carbonic Acid.

* It is not meant that this is the sole action that takes place, it is well known, not to be so, it is only intended by the remark, that the abstraction of water is the main action that takes place.

Equivalent for Grape Sugar $C_{12}\ H_{12}\ O_{12}$
Deduct 4 Equivalents of Carbonic acid Gas.... } $C_4 \quad O_8$

2 Equivalents of Alcohol left $C_8\ H_{12} O_4 = (2C_4 H_6 O_2)$

The formula for Alcohol will therefore be $C_4\ H_6\ O_2$, by simple Oxidation, 2 Equivalents of Hydrogen are subtracted, while 2 more are added to the Oxygen already present.

Thus. $C_4\ H_6\ O_2$ Wine Alcohol.
loses...... H_2 from any source capable of affording it $O_2 = 2$ HO or 2 Eqs of water by Oxidation.

$C_4\ H_4\ O_2$
gains.............. O_2 by further oxidation.

and so... $C_4\ H_4\ O_4$ Acetic Acid, is obtained.

The result obtained by the several actions described is an atificial one, and therefore does not strictly apply to the present subject, but if this Acid was obtained by processes such as go on in plants, 4 Equivalents of Carbonic Acid and 4 water would have been employed, while 8 of Oxygen would have been given out, just in the same way. Formic Acid is obtained artificially from the Oxydation of Wood Spirit thus.

$C_2\ H_4\ O_2$ Wood Spirit
Loses......... H_2 .... by oxidation i. e. 2 of O, forming 2 Eqs of HO

$C_2\ H_2\ O_2$
Gains............... O_2 by further oxidation.

and so... $C_2\ H_2\ O_4$ Formic Acid is obtained.

Practically, it is true, this Acid is obtained by using materials that will furnish Carbon and Hydrogen, and which mixed with substances capable of imparting Oxygen, are partly converted into Formic Acid, thus starch will furnish materials for oxidation, —the oxidizing materials are various, frequently binoxide of manganese and sulphuric Acid are chosen. The actions are conducted in the presence of water, and with a certain increase of Temperature. If no products, but the sulphate of manganese and Formic Acid were obtained, then, as every Equivalent of Binoxide of manganese parts with one action of Oxygen, it would be easy to represent the result, but as other actions take place, this cannot well be done. Formic Acid *per se* occurs only in the animal kingdom, viz in the Red Ant; Butyric, Caproic, Caprylic and Capric Acids are also obtained *per se* only from the animal kingdom, viz. from Butter, but as salts of Œther, all these Acids, except Formic, occur in the Vegetable kingdom, and are the very substances to which our most esteemed fruits owe their flavour. Together, these Œthers give flavour to the melon and the Pine Apple, Strawberry, &c. &c. Pelargamic Œther flavours Whiskey, Œnanthic Œther gives the bouquet to wine, Butyric Œther gives what is called the Pine Apple flavour to Rum. Acetate of Amylic Œther gives flavour to the gargonelle pear, so that it is apparent, that fruit bearing plants manufacture the most exquisite Ethers in their organisms, especially while under scientific culture, that is under the influence of all those conditions which it is not only the business of the Horticulturist and Agriculturist to understand, but to carry out,—for, be it remembered that if climate, including temperature moisture, locality, and all mechanical means are employed, without attending to the inorganic constituents, without being assured that they are of the kind required by the tree or plant, and without seeing that there is a sufficiency of them in the *soluble form* present in the soil, all the other conditions will be vitiated. The Tree may flourish, increase, and put forth leaves in abundance, and even sometimes flowers, but there will be *no fruit*, or at best a diminished supply, so with the Cereals, the Wheat or barley, or Rice may grow and rise even higher than usual, but there is no fruit in the ear or but a small amount; on the other hand, when the appropriate inorganic constituents are in abundance, and in the soluble form, then the actions in the Organisms of the Fruit Tree or Cereal are vigorously carried on, and the result is, that the Fruit and the grain are produced abundantly. One example will prove this as well as a hundred. Liebig added to a waste and barren soil the requisite amount of alkalies, phosphates, silica and sulphates (all mineral and inorganic compounds,) he obtained excellent perennial crops, and wood forming plants, but not cereals, after ascertaining from the ashes of the cereals what was wanting (which was found to be phosphates,) he reflected how the deficiency could be remedied, he knew that a large supply of Carbonic Acid in solution would act on the alkalies and phosphates, so as to make them soluble, he therefore added to the land in question sawdust, which not only would absorb when moist Carbonic Acid Gas, but would furnish a large additional supply, by its gradual decay; thus he intended to bring the phosphates into solution, so that they might be available for the cereal crops; nor was he deceived, the next crops were of the finest description, with a full ear. Throughout these experiments nothing in shape of what is called manure, was furnished to the land, the inference is therefore unavoidable, viz. that the necessary and healthy actions of plants, can only proceed so as to attain the utmost developement of product, when the land furnishes to the plant the appropriate mineral constituents in a soluble condition, and in sufficient quantity.

The general laws which have been applied to shew the formation of the Vegetable Acids mentioned, and to other classes of compounds composed of Carbon, Hydrogen and Oxygen, are equally applicable to the formation of that class of com-

pounds, termed the Fatty Acids, these are all found in Oils and Fats, there are no doubt many intermediate steps and stages in their formation not at present known; without attempting to trace these stages, we know that to form these compounds, a certain number of Atoms of Carbonic Acid and water must have been taken in by the plant, and a certain number of Atoms of Oxygen given out, and this is all that is sought to be shewn by the symbols and equations given. The Formula of these bodies being ascertained by analysis, the factors that were employed become evident, as well as the process carried out by the plant, which is always one of Deoxidation or Reduction, thus;—

Margaric ... $\bar{a} = C_{34}. H_{34}. O_4$
Stearic...... $\bar{a} = C_{34}. H_{34}. O_4$
Palmitic .... $a = C_{32}. H_{32}. O_4$
Cocenic ..... $a = C_{26}. H_{26}. O_4$

34 Atoms of Carbonic Acid must therefore in the 2 first acids have been employed, and 34 Atoms of water, while 98 Atoms of Oxygen have been given out.

In Palmitic Acid 32 atoms of Carbonic Acid and 32 of water must have been employed, and 92 of Oxygen given out. In the Cocinic Acid, $C_{26}\ O_{52}$ Carbonic Acid + H_{26} + O_{26} Water = $C_{26}\ O_{78}$, therefore 74 of Oxygen have been given out. In this list it will be observed, that the Oxygen never exceeds 4 Atoms, whatever may the number of the Atoms of Carbonic acid and Hydrogen retained. In Camphors and Resins the amount of Oxygen left in combination, is still further reduced, in few cases exceeding one or two Atoms, the whole amount taken up being (with the exception of the one or two Atoms combined), got rid of. Finally a group of substances known to chemists as Carbohydrogens, are manufactured in the Organisms of plants. In this remarkable Group, the *whole* of the Oxygen taken up, whether as Carbonic Acid or water, is got rid of. Thus oil of Turpentine has the formula of $C_{10}\ H_8$, which indicates that 10 Atoms of Carbonic Acid, and 8 Atoms of water, by giving out 28 of Oxygen, leave $C_{10}\ H_8$, or 1 atom of Turpentine oil, in the producing tree. The oils of Orange peel, Bergamot, Pepper, Cubebs, Juniper, Capivi, Elemi, L. Lemons, Indian Grass and the Hop, are all Hydro-Carbons, i. e, the plants manufacturing them, give out the whole of the Oxygen taken in, either as Carbonic Acid or Water, leaving only a Binary compound, though differing in each particular case.

The various classes of compounds that are formed in plants from Carbonic Acid and Water, when all the necessary conditions for their health and vigour have been provided for, having been thus rudely sketched out, a short notice of the separate conditions to be known and attended to, when plants form nitrogenous compounds in their organisms, is necessary to complete the intended picture, for this purpose it is obvious, that plants must take in Nitrogen in some shape. For many years, how this was effected was a disputed question, at last however such a mass of evidence has been adduced, to shew that the shape in which Nitrogen enters into the organisms of plants is Ammonia, that chemists in general regard the question as settled, and believe that Ammonia does enter the organisms of plants, and that its Nitrogen is there fixed; the Hydrogen being in part or altogether removed in the forms of water. Admitting then that this is the fact, the constant source of the Amonia is next to be considered, it appears that there is a small quantity of this compound always present in the Atmosphere; rain water always contains it, although this cannot be demonstrated, unless a quantity of it be evaporated to a very small bulk, then by adding a little Hydrochloric or Sulphuric Acid, it is obtained in the form of Sal Ammoniac, or Sulphate of Ammonia, which salt can be made to give up Ammonia by any of the ordinary tests. How it becomes mingled with the air is not a question, it is well known that all animal substances undergoing decomposition give off Ammonia, and so do many vegetable substances under the same circumstances From these statements, which are all advanced on the strength of repeated experiments, it is clear that the atmosphere, contains every ingredient required by plants, even for the most complex compounds, except the Alkalies, Phosphates, Sulphates, Silica &c., derived from the earth; because, in the atmosphere we find Carbonic Acid, water, and Ammonia, which compounds are all binary, and by suffering decomposition within the plant, afford the necessary elements. Carbon, Hydrogen, Oxygen, and Nitrogen, from which with the acid of the Salts &c. furnished by the earth, every organic compound found in nature is formed.

Nor are the natural processes different in character from those already described, although the stages or intermediate actions may be more difficult to trace. The final result is one of Reduction. Since so many atoms of Carbonic Acid, Water, and Ammonia are taken into the plant, while a certain number of Atoms of Oxygen are given out, as well as so many Atoms of water, both the Oxygen and Hydrogen compounds being reduced, i. e. one, two, or three Atoms of Hydrogen are taken from the Ammonia while the like number of Atoms of Oxygen are taken from the Acid, or other Oxygen compounds present, and are given out as one, two or three atoms of water, while the Ammonia is reduced to an Amide, Imide, or Nitryle compound. This kind of action is well known even in the inorganic department of Chemistry, the first of these compounds that attracted attention, was the one thrown down when a solution of Corrosive sublimate is treated with Ammonia, it was long known only as *white precipitate*, it is now known to be a peculiar compound containing Amide of Mercury, and is formed in this way; two Equivalents of the Chloride of Mercury, and two of Liquor Ammoniæ

unite to form two new compounds, Sal Amoniac, and white precipitate

Hg Cl. one Eqt. of Mercury Chloride Hg Cl. one Eqt. of Mercury. N H3 one Eqt. of Ammonia. N H3 one Eqt. of Ammonia.	which contains the amide of mercury ; one Equivalent of.

Ammonia splits up, losing one of Hydrogen, which goes to the remaining Equivalent of Ammonia, and forms ($N\ H_4$) Ammonium, which unites with one Equivalent of Chlorine, and forms $N\ H_4$ Cl. or Sal Ammoniac, while one Equivalent of (Hg. Cl.) chloride of mercury, unites with the amide of mercury (Hg. $N\ H_2$), forming together Hg Cl, Hg. $N\ H_2$, white precipitate.

In this case, the reduction is effected by means of Chlorine, but the nature of the resulting compound is just the same, as if the reduction had been (as it is in plants) effected by Oxygen for the compound $N\ H^2$ is arrived at.

Oil of Bitter Almonds has the Formula $C_{14}\ H_6\ O_2$ (Empirically written). Pratically $C_{14}\ H_5\ O_{12}$, this acted on by 2 dry Atoms of Chlorine suffers abstraction of one Atom of Hydrogen, forming 1 Equivalent of Chloride of Benzoile, ($C_{14}\ H_5\ O_2$ + Cl.) and one Equivalent of Hydro-chloric Acid (H Cl.) and Chloride of Benzoile ($C_{14}\ H_5\ O_2$ Cl) acted on by 2 Equivalent of dry Ammonia, gives 1 Equivalent of (H Cl.), and one Equivalent of Benzomide ($C_{14}\ H_5\ O_2 + N\ H_2$), these are instances brought about artificially in the Laboratory, but they are useful to shew the kind of action taking place inplants, when $N\ H_3$ Ammonia, is to be reduced, and compounds with $N\ H_2$ to be formed, many instances in nature have not yet been met with, one however may be brought forward to prove that theory is but keeping pace with fact, thus in Asparagus, Malic Acid and Ammonia, are brought into contact, under ordinary circumstances Malate of Ammonia, would be formed not so however in this case, two equivalents of water are abstracted, (the acid being Bibasic) the action being as follows.

Malic Acid. Ammonia.

$C_8\ H_6\ O_{10} + N.\ H_3$

$C_8\ H_6\ O_{10}$ / H_3 ... N. } Factors added together.

$C_8\ H_9\ O_{10}$ N. = Total of Elements employed.

$H_2\ O_2$ = 2 H O subtracted or given out.

$C_8\ H_7\ O_8\ N = C_8\ H_5\ O_8 + N\ H_2$

Malamide.

Malamide or Asparagine, from this it is clear that reduction of Ammonia ($N\ H_3$) takes place in nature's laboratory, as well as in the Chemist's, Imides are not known to be formed except artificially; Nitryles have such a relation to Cyanogen that makes it uncertain whether many of the compounds called Nitryles may not be Cyanides, or whether some Cyanides may not be Nitryles, Nicotine and Conine are suspected to be Nitryles, but they may be Cyanides. Without attempting to trace the steps by which a final result is reached, it is evident, that when the formula of a Nitrogenous substance is known, it is not difficult to see how many Atoms of Carbonic Acid, Water and Ammonia have been employed in its formation. For instance Nicotine has the Formula $C_{10}\ NH_7$, and Conine has the Formula $C_{16}\ NH_{15}$, in these cases we see that 10 Equivalents of Carbonic Acid, 7 of water, and one of Ammonia have been employed to form Nicotine, and that 27 of Oxygen have been given out, but whether the Nitrogen be associated with Hydrogen as an Amide, Imide, or without as a Nitryle, we have no present means of judging, since we can neither trace the steps of reduction, nor can we decompose Nicotin, so as to shew in what way the Nitrogen is combined, whether the action of dry Chlorine on Nicotin would throw any light on the subject; I do not know, as I believe no trials have hitherto been made. The same kind of view may be taken of the formation of Conine, as of Nicotine, and in fact of all similarly constituted bodies, which includes a very important class, viz., that of all the vegeto-alkalies, or natural alkaloids found in plants containing nitrogen. Dr. Gregory has selected with his usual accuracy and comprehensive knowledge a number of cases which tend to show, that in all nitrogenous compounds not containing sulphur, we have just grounds for thinking that they are amides, or have been derived from such compounds.

When sulphur is found associated with nitrogen in organic compounds, it is a proof that they are complex and of the highest degree of elaboration, since all such compounds, and with the exception of sulphocyanide of allyle (oil of mustard) are compounds fitted for the highest offices, that any kind of vegetable food or product can fulfil, viz., that of repairing the wasted tissues of the animal. Such compounds as these are widely diffused and abundantly found in the seeds or fruit of the gramineæ, leguminosæ, &c. &c.; they are generally known as the albuminous compounds of vegetables. These albuminous compounds in consequence of certain differences, are distinguished from the other by the terms fibrin, albumen and caseine. The 1st, also called glutin (as in wheat) is distinguished by its spontaneous power of coagulation. The 2nd, called in some case emulsine is found in most vegetable juices, and in almost all seeds, in the solid form, distinguished by its coagulability at a heat of 160° or even lower. The 3rd, termed legumine, from being found so largely in the seeds of leguminous plants, is distinguished by its own spontaneous coagulability, and by the non-effect of heat to set up this action, though it causes what is termed a pellicle, weak acids cause it to coagulate.

These three important compounds, though in the first instance built up in the organisms of *plants* from *inorganic elements*, are found in all animal bodies, and the chemical constitution of all three, whether taken from the animal or vegetable kingdom is identical.

Animal organisms cannot form either of these compounds, though they have the power of converting one into the other; with these considerations before him, well might Liebig say, that the vegetable kingdom was the workshop of the animal, since this, though it may sound strange is literally the fact. The pasture grasses form the albuminous compounds on which cattle thrive and flourish, therefore, when we eat beef steaks or mutton chops, we may remember that the albuminous and fibrinous compounds which we eat as meat were given to the sheep or ox ready formed by the grasses on which they fed.

That the living animal, by its organism is not called on to effect what is done by that of the vegetable, is proved by the fact that milk which is food of all young animals, always contains one of the albuminous compounds described, viz., casein, and furnishes the blood. Milk, whenever it is required in this instance, though the blood which furnishes the milk contains fibrine and albumen, it contains no caseine, while the milk which contains no fibrine (and only immediately after parturition albumen) contains casein in abundance. If further proof be required of the power of conversion possessed by the animal organism, it is found in the fact, that the milk after being taken into the organism, is readily converted into fibrine and albumen, since infants who have taken no other food than milk, increase in weight and size, and therefore contain a large amount of fibrin and albumen in their blood and tissues, than they did at birth. These facts alone seem sufficient to show the unrivalled importance of these three bodies to men and animals; and it will be hereafter seen, that to vegetables themselves the presence of an albuminous compound in their seeds is scarcely less so. The utility, not to say necessity of understanding every thing connected with the actions subserving to the development of these bodies seems indisputable. Taking this for granted, no apology will be needed for dwelling a little on the various circumstances with which the agriculturist should be acquainted.

First he should know precisely exactly every constituent present in the seeds of the cereals or grasses he is about to cultivate; now, though individual members of the class may show different proportions in the constituents present, he will find the following kinds of substances in all the seeds of the cereals.

Starch or Saccharine matters,
Albuminous matters,
Inorganic matters.

1st. The starches &c. are all composed of C. H. O. these are in fact the matters that support respiration and animal heat.

2nd. The albuminous matters composed of Carbon, Hydrogen, Nitrogen, Oxygen and Sulphur-associated with *Phosphate of Lime*.

3rd. The Salts &c. these include Water. Carbonic Acid, Potash, Chlorides, Iron, Sulphuric Acid, Silica, Lime and Ammonia—Magnesia.

The Agriculturist must next investigate the soil on which these cereals are to be grown—he must see that all the mineral constituents required are present not only in sufficient quantity—but that they are in an available form—let the quantity of Phosphate of Lime be ever so great, this will not be available unless Alkalies are also present, and Carbonic Acid in excess, these conditions are required to bring the earthy Phosphate into the soluble form—this being accomplished, the formation of the important compound Albumen can proceed, provided that the other conditions required are scrupulously fulfilled. First there must be a full and free supply of water to allow of the constant mobility of the different and opposing Chemical Atoms taken into the plant. The circulation of the fluid taken in must not be unimpeded by too low or high a temperature, the healthy mean which allows a wide margin must be preserved. The sun light must be allowed free excess, as well as the Air with its various kinds of food—under these conditions free evaporation of moisture from the leaves takes place. Thus forming a continued partial vacuum in the upper vascular and cellular portions of the plant, and aiding the Capillary attractions between Surfaces and fluids and Endosmotic penetrations through membranes, while the opposite nature of the fluids on either side of membranes of the cells sets up the continuous feeble galvanic agencies by which the wonderful decomposing powers of plants are developed, and the fixation of this atom, with the evolution of that accomplished.

The vegetable Apparatus being in perfect order, and working well under all the conditions specified, it remains to notice as far as our present knowledge will permit what takes place. The Formula for Albumen and Fibrin is the following. C_{216} H_{169} N_{27} S_2 O_{68}.

	Carbon.	Hydrogen.	Nitrogen.	Sulphur.	Oxygen.	Total Atoms.
Albumen and Fibrin.	216	169	27	2	68	482
Casein, which differs in all but the Sulphur.	288	228	36	2	90	544

Now the elements above specified existed as Carbonic Acid, water, Ammonia and Sulphuric Acid, at the time of being taken into the plant, therefore the number of Atoms so taken in must be as follows—in order that there may be materials wherewith to form the compound required viz. Albumen.

216 Eqts. of Carbonic Acid $= C_{216} O_{432}$.	88 Eqts of Water $= H_{33} O_{88}$.	27 Eqts. of Ammonia $= N_{27} H_{81}$.	2 Eqts. of Sulph : Acid $= S_2 O_6$.

therefore, adding all atoms of the same name together, we find that as a total of materials employed, there are of Carbon 216, H169, N27, S2, and O526, which again added together, make up the sum of 940 for the different atoms employed. But the Formula for Albumen shews only a total of 482 for the number of atoms found in it by Analysis, therefore we see that 940—482=458 atoms of some kind expelled, and if we look at the number of atoms of Oxygen, shewn in the formula for Albumen, we find 68, again if we deduct 68 from the total of Oxygen taken into the plant viz.

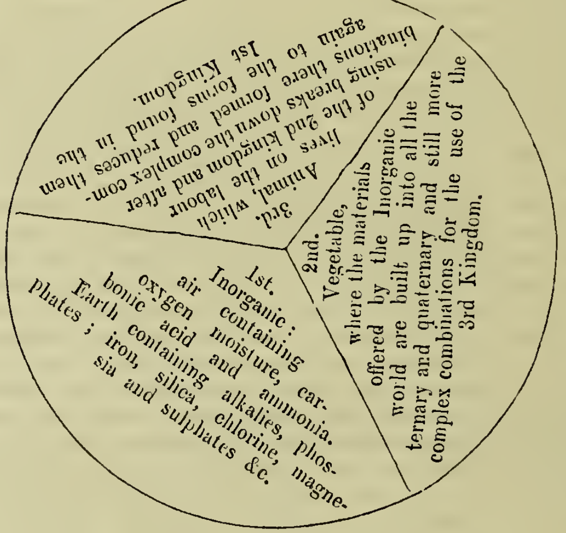
$$\begin{array}{r} 526 \\ 68 \\ \hline 458 \end{array}$$

we have 458 left, therefore we see what kind of atoms have been expelled from the plant, and this is in strict accordance with the laws previously laid down, but it is supposed that one of the essential steps towards the final result is the formation of grape sugar, and if this be so (and it is quite within the limits of probability, as there would in this case be no violation of or departure from the known and ascertained processes going on in plants), a certain number of Equivalents of water as well as Oxygen would require to be got rid of, as may readily be seen by the aid of the following Diagram; 216 Equivalents of Carbon require if produced from Grape Sugar 18 Equivalents, since the formula for Grape Sugar is C_{12}, H_{12}. O_{12} and $12 \times 18 = 216$, it follows therefore, that the formula for Grape Sugar multiplied by $18 = C_{216}\ H_{216}\ O_{216}$, which were taken into the plant in the shape of Carbonic Acid and water, the number of Atoms given to make up the Carbonic Acid and water, would be 216 Carbon, and 432 Oxygen, with 216 Hydrogen, and 216 Oxygen, then looking at the formula, it appears that the whole of the Oxygen belonging to the Carbonic Acid has been expelled, viz. 132 Atoms, making good the remark that Sugar is but Carbon and Water. Now to these 216 Carbon, 216 Hydrogen, 216 Oxygen Water present in the 18 equivalents of Sugar, if we add 27 equivalents of Ammonia and 2 equivalents of Sulphuric Acid, we have again the materials wherewith the organism contrives to form albumen, bearing in mind however that to do this, there must be an expulsion of water as well as of Oxygen.

	C	H	O	N	S	
Total of materials employed	216	216	216			= 18 Eqts. Grape Sugar.
	„	81	„	27		= 27 Eqts. of Ammonia.
	„	„	6	„	2	= 2 Eqts. of Sulphuric acid.
Subtract	C 216	H 297	O 222	N 27	S 2	
Formula for Albumen	„ 216	„ 169	„ 68	27	„ 2	
	„	H 128	O 154	„	„	128 Atoms of water, 26 of Oxygen expelled.

From the Diagram it will be evident 1st, that nothing opposed to the known operations going on in the plant has been predicated. 2nd that by these operations admitting that the plant takes in the Carbonic Acid, the water, the Ammonia, and a Sulphate that will furnish Sulphuric Acid (which no one will dispute), decompositions are effected within the organism of the plant, amongst the Inorganic materials taken from the soil, which produce new compounds, and end finally, in the formation of Albumen and its congeners, and though the steps are unknown or but suspected, the kind and nature of these processes is satisfactorily accounted for, in so far, as the facility of such formations is clearly demonstrated. 3rdly the series of facts observed during the growth of the plant, ending in the development of its fruit or seed, in which these albuminous substances are chiefly found, affords indisputable proof that these substances are built up in the organism of the plant during its life time. Our information then up to this point is precise, what we still want is the knowledge of the various steps by which the known results are arrived at. We know that the processes by which all vegetable products are formed, are processes of Deoxidation, and on the other hand we know, that all the processes carried on in animal organisms are processes of oxidation. By Deoxidation the vegetable builds up some of the most complicated products, even those capable of replacing the wasted portions of our Muscular, Vascular, Cellular, Gelatinous, Osseous and Nervous Tissues. By Oxidation the animal breaks down step by step these complicated products, till at last, they are brought back to the state of simple binary compounds, viz. Carbonic Acid, Water, and Sulphuric Acid, i. e. into the very identical forms which were taken up by the vegetable, such are the results of the absolute and perfect economy of unapproachable wisdom, the arrangements by which they are effected, we are permitted to trace in such proportion only as serves to shew us, the immensity of that we cannot trace, the same atoms, that under certain conditions and the influence of certain external forces went to make the Acid of the Lime, the Saccharine matter of the Sugar cane, the starch of our Corn or Rice, or ascending a step higher in the scale, the deadly poisons or potent remedies (which destroy or cure as they are wielded by the murderer or the Physician), and finally the Albuminous compounds, which restore the waste of our bodies. These same atoms, after

having served the purposes which they were destined, in two living organisms, are returned to the air or the Earth, ready to perform again the same circuit, when called upon. Limited and small as our physical and mental powers are, it is scarcely possible for any one who thinks not to see in part the unspeakable beauty and all pervading harmony of the arrangements that subserve to the ends contemplated. Here in the inorganic portion of the eternal circle, are the Alkalies the soluble and insoluble Phosphates, the Iron, Ammonia, Chloride of Sodium, Silica, Carbonic Acid and Water, manufactured by the second section of the circle (the vegetable Kingdom), into products without end, serving to the comfort, enjoyment and life of the third section of the circle (the Animal Kingdom) which again after using the products prepared by the second section for the maintenance of animal life, and for the innumerable purposes of the arts, manufactures, and science, returns the Atoms to the First Section, chiefly in the very forms in which they were originally found, without loss or diminution; while by the opposite though harmonious marking of the actions of the 2nd and 3rd Sections of this our circle (the world), the healthy constitution of the atmosphere is preserved immutably, thus keeping it equally capable of affording the moisture and Oxygen required to maintain Animal Life, and the Carbonic Acid, moisture and Ammonia required for that of the vegetable.



The bearing of the foregoing remarks will be sufficiently obvious, if the meaning of Scientific Culture be really understood in its true sense, which is nothing more than on the one hand to fulfil every necessary condition for the growth of the plant, and on the other to withdraw and take away every thing in the shape of impediment. True it is, that the cultivator, has not always at command some of the essential conditions, for instance he cannot on the large scale alter his temperature, nor can he change the current of nipping winds, frosts, blights &c., but as far as possible his business is to see that all required conditions are fulfilled, and he cannot do without knowing what the processes are, that he wants to further, and in the event of failure to what this failure is owing, the kind of knowledge required to ascertain this has been already considered, it therefore only remains, as I have no fear that the great importance of the subject will be acknowledged, to advert to the impossibility of imparting to the cultivator such knowledge, without establishing a system of instruction in imitation though at a humble distance of that now carried out in Great Britain, Germany, and France. The ignorance of the people generally is the great bar. In Europe men of the highest intelligence, and of the highest rank devote themselves with untiring zeal to the study of agricultural Chemistry, and Physiology, here nothing I fear but the immediate prospect of increased gain would induce any native agriculturist to become an educated man, the gain promised by this kind of knowledge is not immediate—since to acquire the requisite education years of study are required—it may however be a consideration, whether if a person who had been properly instructed were attached to each Collectorate, these Districts might not be made more productive, and thereby the revenue of Government increased. In consequence of the urgent calls for this report, I have been obliged to conclude it somewhat hastily, having scarcely touched on the subject of manures, which as they are so intimately connected with the subject of culture I intended to have dwelt on at some length, I have however, I trust, said enough to shew what manures are intended to effect, and have only in concluding this Report to express my regret, that from indifferent health and other causes, I have not had more leisure to devote to such a subject. The faulty and unpolished phraseology employed throughout this paper is no doubt sufficiently open to criticism, as all productions written so hastily, and at constantly interrupted periods must be, but if the doctrines and views set forth are admitted to be in accordance with acknowledged facts, and if the illustrations are in keeping with the science of the day, I am content to bear with censure on other accounts.

JOHN MAYER, *Professor of Chemistry.*

CLASS IV.

VEGETABLE AND ANIMAL SUBSTANCES, CHIEFLY USED IN MANUFACTURES, AS IMPLEMENTS OR FOR ORNAMENTS.

ALSO

CLASS XIV.

MANUFACTURES FROM FLAX AND HEMP.

ALSO

CLASS XXVIII.

MANUFACTURES FROM ANIMAL AND VEGETABLE SUBSTANCES NOT BEING WOVEN OR FELTED, OR INCLUDED IN OTHER SECTIONS.

The Honorable Sir H. C. Montgomery, Bart.
The Honorable W. Elliot, Esq.
W. E. Uuderwood, Esq.
Lieutenant Colonel G. Balfour, C. B.
H. F. C. Cleghorn, Esq. M. D.
Colonel F. A. Reid, C. B.
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Lieutenant Colonel T. T. Pears, C. B.
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Major J. Maitland.
Colonel W. H. Budd.
Lieutenant Colonel A. McCally.
Colonel P. Hamond, *Reporter.*
Major G. Simpson.
Captain W. C. Baker.
Captain C. Biden.
W. E. Cochrane, Esq.
J. Binny Key, Esq.
W. Arbuthnot, Esq.
J. L. Lushington, Esq.
J. T. Maclagan, Esq.
A. T. Jaffrey, Esq.
Lieutenant Mitchell, *Reporter.*
T. Peachey, Esq., *Reporter.*
Dr. W. Flynn, G. M. M. C.
W. B. Wright, Esq.
G. Williams, Esq.
N. C. Mooroogasem Moodeliar.
C. V. Conniah Chettiar.
C. Runganada Shastree,
Sub-Conductor Briggs, *Reporter.*
W. B. Liddell, Esq.
Captaiu Hawkes, *Reporter.*

SECTION I.

GUMS AND RESINS.

SUB JURY.

Lieutenaut H. P. Hawkes, *Reporter.*
Dr. W. Flynn, G. M. M. C.
H. F. C. Cleghorn, Esq. M. D.

Under this head are included the following:—Piney or Vateria, Canarium, and Vatica or Shorea resins, all known under the name of "dammer"; Kino, Lac, Dikkamaly, Benjamin, Myrrh, Poon-yet, Mutti-pal, Aloes, Gamboge &c. &c. &c.

The most important of all the solid resins produced in India are those which are included under the general name of "Dammer," and it will be the chief object of this report to clear up the doubts which have hitherto existed, as to what particular trees yield each of the crude products found in the bazaars. It will therefore be advisable to quote the various authorities

on the subject, before proceeding to show the result of the Jury's investigations.

Ainslie speaking of "dammer or Indian resin" which he refers to the *Chloroxylon dupada* of Buchanan (the *Vateria indica* of Linnæus,) says :—"Of the substance usually termed dammer and improperly country rosin, there are three sorts to be met with in the Bazaars, called in Tamil "*vullay coonghilium*"* "*curpoo coonghilium*" and "*noray coonghilium*" or white, black, and coarse dammer. It much resembles the resin obtained by distillation from the turpentine of the *Pinus sylvestris,* both in appearance and natural qualities, and would seem to be a common product of many Asiatic countries. I perceive it is to be procured in great abundance in Sumatra from a tree called by the Malays "Canari."† (*Dammara nigra legitima* of Rumphius.)

In Java, Borneo, Joanna and several of the Sooloo islands, it (dammer) is quite common, and a regular export to the continent of India. The coarse or stony kind the Malays call "dammer batu" and the Javanese "dammer selo," the white or fine sort they term "dammer putch." * * * * * *

Dr. Buchanan (now Hamilton) in his interesting "Journey through Mysore" informs us that he found the tree which yields dammer growing in the woods of Malabar, and in the mountainous tracts which separate the Travancore country from the Madura district, and bestowed on it the scientific name of ‡*Chloroxylon dupada,* though I know well that the greater part of the dammer met with in India, is an import from more Eastern countries. How far the "*Chloroxylon dupada*" differs from the §*Dammara nigra legitima* of Rumphius I regret to say I am not now prepared to state." * * * * * *

In short, omitting what refers to foreign products with which we have no immediate concern, the whole of Ainslie's remarks may be briefly summed up as follows—

His *vellay* and *noray coongilium,*‖ or white and coarse dammer are the products of the Vateria Indica of Linnæus (the *Chloroxylon dupada* of Buchanan), which is the *Dupa maram* of the Canarese, the *Chadacula* of the Tamools, and the *Payanee* or *Piney* of Malabar. His *curpoo coongilium* or black dammer is the product of the *Canarium* of Roxb. and Wight, the *dammara nigra legitima* of Rumphius, and the *Canari* of the Malays.

Roxburgh's description of the principal resiniferous trees of India is here given as extracted from O'Shaughnessy's Bengal Dispensatory.

VATERIA. *Sp.—Vateria Indica—Vern. Piney marum.*

This is a very large and stately tree, a native of Malabar, and lately found also in Mysore. The young shoots and all tender parts except the leaves are covered with fine stellate pubescence, leaves alternate, petioled, oblong, entire, from emarginate to obtuse, pointed, smooth, coriaceous, from four to eight inches long and two to four broad, petioles round, about an inch long; stipules oblong, panicles terminal, ramifications rather remote; flowers rather remote, pedicelled, pretty large; bractes oblong, one flowered; calyx five, cleft to the base, divisions oblong, obtuse, villous on the outside, corolla five petalled, petals oval, emarginate, broader but very little longer than divisions of the calyx, filaments from 40 to 50, short, broad inserted between the petals and the base of the germ, anthers linear with a single filiform beak; germ superior, conic, downy, three celled, cells

* Ainslie's "Curpoo Coonghilium" is doubtless the product of the *Canarium* of Sumatra and the Western coast of India, whilst his other two sorts may be either the products of the *Vateria* or *Shorea,* probably both. The three varieties are *not* the produce of the *same* tree as Ainslie seems to have supposed.

† The *Canarium* of Roxburgh. This yields the black dammer of the Western coast of India.

‡ The tree to which Dr. Buchanan gave this name had been already described by Linnæus under the name of *Vateria Indica,* which it still retains. The specific name *dupada* was derived by Dr. Buchanan from the Canarese name "dupa" applied to this and probably to other species of the Vateria growing in Mysore and the Western Coast. It may also be noted that the *Canarium strictum,* called by way of distinction the "black dammer tree" grows in precisely the same locality, and bears such a general resemblance in the color and shape of its leaves and growth, to the Vateria, that it can only be distinguished on a somewhat close inspection. From this circumstance no doubt arose the belief that both the white and black dammers were produced from the same tree, and as the few which Dr. Buchanan saw were probably *Vaterias,* he naturally concluded that this tree alone yielded both species of dammer.

§ They are the same.

‖ This supposes them to be the products of the Western coast and derived from his Chloroxylon dupada—the white dammers of the northern Circars, which will be considered hereafter, are derived from the Shoreas.

containing 3 ovules each, attached to the top of the axis, style longer than the stamens, stigma acute, pericarpium a coriaceous, fleshy, oblong, obtuse, one-celled, three-valved capsule, general size about 2½ inches long and 1½ in diameter, seed solitary of same shape as the capsule. (*Roxb. Fl. Ind. p.* 601).

The substance called "East Indian copal" and sold in England as gum *animi* exudes abundantly from this tree. It occurs of all shades of color between pale green and deep yellow, the finest pieces are called **kah'oba,* and sold as *amber* in the bazaars of Bengal; the resin before it hardens is the Piney varnish of Malabar. Besides the uses already alluded to, candles are made of this resin in Malabar, which Dr. Wight informs us, diffuse in burning an agreeable fragrance, give a fine clear light with little smoke and consume the wick without snuffing.†

Canarium. *Sp.—Canarium commune.* (*Roxb. Fl. Ind. Vol.* iii. *p.* 137).

A native of the continent of India, the Archipelago and Isle of France, where it is called "Bois de Colophane." It was brought from the Moluccas to the Botanic garden, but in Roxburgh's time did not thrive, owing to the coldness of the winter months. The bark yields an abundance of limpid oil with a pungent turpentine smell, congealing into a buttery camphoraceous mass.

Another species, the *C. Bengalense,* yields a large quantity of very pure clear amber colored resin which soon becomes hard and brittle, and is not unlike copal, yet the natives set little or no value upon it. In the Calcutta bazaar it sells at 2 to 3 Rs. per maund of 80 lbs. It is a native of Sylhet and the adjacent mountainous countries and flowers in May and June.

The dammer of the Northern Circars is chiefly produced by the varieties of the genus Shorea,‡ of which O'Shaughnessy gives the following description.

Shorea.—*Shorea robusta—Saul tree.*

This is a tree of great size, a native of Morung, the Paulghaut mountains &c. Sepals 5 afterwards changing into 5 long wings, petals 5, stamens 15, filaments capillary below the anthers, anther cells short, obtuse, connectivum filiform, produced beyond the cells into a more or less elongated, colored, deciduous bristle, ovarium 3 celled, with two pendulous ovules in each cell. Seed solitary, cotyledons stalked, not crumpled, radicle superior, leaves coriaceous, oblong, obtuse, often emarginate at the base, panicles numerous from the axils of the fallen leaves, branches and pedicels glabrous.

The *Shorea robusta,* and indeed some other species, yield abundance of the resin called dammer, the superior kinds of which are efficient substitutes for the pine resin of the European Pharmacopœiæ. From Capt Jenkins of Assam we have received specimens of this resin perfectly transparent and colorless; in the bazars the color ranges from pale amber to dark brown. It is devoid of taste and smell. Sp. gr. 1,097 to 1,123, easily fusible, partially soluble in alcohol (83,1 per 1000) almost entirely in ether, perfectly in oil of turpentine and the fixed oils; sulphuric acid dissolves and gives it a red color. Two parts of colorless dammer and 2½ parts of oil of turpentine, make the best varnish for lithographic drawings.

Lastly we proceed to extract Wight's graphic descriptions of the resiniferous and balsamiferous trees of India.

Under the head *Dipterocarpeæ* he observes—

The trees of this order growing in Madras are all natives of the hilly tracts of the Balaghaut. In Silhet, Chittagong and Pegu where they abound, they occupy the plains. In Java one species (*Dipterocarpus littoralis*) is found on the sea shore.

A *Hopea* and *Vateria indica* also approach the coast in Malabar, but the latter or perhaps a distinct species is also plentiful in Mysore. Two or three species are found in Goomsur forming extensive forests, and affording to the inhabitants incense, dammer and wood oil. Judging from the imperfect specimens collected by Dr. Maxwell and Capt. McPherson, one of them belongs to Roxburgh's genus *Shorea,* apparently *S. robusta.* Both these Gentlemen mention *Chloroxylon dupada* as being one of them, but this I think must be a mistake, originating in a statement of Dr. Ainslie that this is the botanical name given to the Indian dammer tree by Dr. Buchanan, but which was an

* The Hindoostani name for amber.

† These candles were at one time introduced into England, but a very high duty having been imposed the trade ceased.

‡ The *Shoreas* are also found growing to a limited extent on the Western coast, but do not appear to produce much, if indeed any, of the resin collected for sale.

error of his, arising from his not being aware that several trees produce dammer, and that his *Chloroxylon dupada* was already described by Linnæus under the generic name of *Vateria*. The Shoreas (Roxb.) or Vaticas (Linn) and Vaterias yield the solid product called dammer and Pinay, whilst the produce of the Diptero-carps' retains its fluidity and is the "wood oil" of the bazaars. The Camphor tree of Sumatra is a species of *Vatica* (*Shorea camphorifera. Roxb.*) The Vateria Indica (*Chloroxylon dupada* of Buchanan and Ainslie, and the Piney maium of the Hindoos) produces a resin resembling Copal, much finer than that procured from others species natives of India, the finer specimens of which are as transparent as amber and nearly colorless. It is procured by the very simple process of cutting a notch in the tree sloping inwards and downwards. This is soon filled with the juice, which in a short time hardens by exposure to the air.

Under the head of "*Canarium*," Wight observes—

The resinous juice of the *Canarium commune* has properties similar to Copaiva, while the kernels of the seed on the other hand afford by expression, a bland edible oil. The *Canarium strictum* of Roxburgh is known in Malabar under the name of the "black dammer tree" in contradistinction to the *Vateria* or "white dammer tree." This tree is rather common in the Alpine forests about Courtalum in the Tinnevelly district, and is there regularly rented for the sake of its dammer. The dammer is transparent and of a deep brownish yellow or amber color when held between the eye and the light, but when adhering to the tree has a bright shining black appearance. The flowers of the species I have not seen, the fruit is a very hard three celled oval nut, tapering at each end."—*Wight Ill.*

Having thus given some comprehensive extracts of all that has been written on the subject, it becomes the task of the jury to identify the various products which have been transmitted to the Exhibition, and to arrange them under their several heads. To this end extracts from the answers which have been received from various gentlemen who have been addressed on the subject are here given, and will be followed by a general summary of the information gained.

E. J. Waring, Esq., whose well known labours in this department of science, render his opinions worthy of the utmost confidence, remarks; "The substances known as "*black dammer*" and "*white dammer*" are undoubtedly the produce of different trees. The *Black dammer* tree appears to be the *Canarium strictum* (Roxb. Fl. Ind. Vol. iii. p. 138.) It does not grow on the low lands of Travancore, being only found in the mountainous regions between Travancore and Tinnevelly. General Cullen who has paid much attention to this subject, informs me that he has never heard of the true Saul tree (*V. robusta*) in our forests, but the *Vatica tumbugaia* is common in Travancore, it is called Tumbagum or "Cumbagum" and at Courtallum "Congo." The *white dammer*, or vullay coonghilium of Ainslie, is I think without doubt the produce of the *Vateria indica.* I send you two specimens of the resin very different in appearance, one dense with a vitreous fracture and of a pale green color, the other very porous or vesicular of a bright amber color. I am assured by those who have the best opportunities of knowing, that they are both obtained from the *Peyni marram* or *Vateria indica*, the denser one being the natural exudation which has spontaneously hardened on the tree, and its surface you will perceive bears witness to the fact, whilst the other has been obtained by incision and subsequent exposure to the sun or fire to hasten the hardening process. All kinds of *vellay coonghilium* or white dammers that I have met with on the Western coast are referable to one of these specimens, the difference arising from the mode of collection, and perhaps depending somewhat on the age of the tree. As far as I can learn there are no other trees in Travancore which yield dammers of any kind."

In a subsequent letter the same gentleman observes "when last I wrote I spoke confidently of the white dammer being the exudation of the *Vateria indica.* From subsequent enquiries this opinion must I think be slightly modified as I am assured by one of the largest collectors of this article to the north (near Cochin) that much of the difference observed in different specimens arises from the *kind* of Piney maram from which they are obtained. The one kind he describes as having longer, narrower and thinner leaves than the common Piney maram (*Vateria indica*). I have never seen the tree myself but probably it is the *Vateria lanceolata.* In speaking of the "white dammer tree" therefore it would be perhaps advisable to say "*Vateria Indica and allied species.*"

On the 18th May, in advising the Committee of the transmission of specimens* of the white and black dammer trees, Dr. Waring says, "I regret that there are no flowers to the specimens of the black dammer tree, but the fruit and arrangement of the leaves at once prove that it is *not* a Dipterocarpus, and consequently *not* the *Vatica tumbugaia,* whilst at the same time it appears to me clearly to be a *Canarium.*†

I send you Mr. Brown's interesting letter which accompanied the specimens.

Regarding these Mr. Brown writes :—" It seemed to me that if there was still a doubt as to the "black dammer tree," it must have been due to want of authority in the specimens produced, and thinking that I could not help you well by such proxy as I could have obtained, and as I expected to be down here near the base of the Ghauts and in the region of Dammer trees within a fortnight, I the more readily postponed the matter. The "black dammer tree" was in flower about the beginning of April as far as I could guess from the seed vessels, and the white dammer tree in the beginning of May. Both trees grow in the forests here about 1800 feet above the level of the sea, but the white dammer tree seems more common than the other, perhaps because the hill men getting more dammer from the latter destroy it more readily. The best specimens of the *black dammer* tree which I examined were about two yards in girth at the height of four feet above the spread of the roots. The trunk is round, straight and smooth, rising 20 to 30 feet before branching, the bark generally whitish dotted with small papillæ, peels off in long flakes. The dammer that exudes from the cuts in the trunk seems to be a great favorite of several species of insects especially of one resembling a bee called by the Hill men "kulliada" (*earth hole*) ‡ which live in pairs in holes in the ground. I send you specimens of the bark as well as of the black dammer taken by me from one of the trees. The Hill men to get the dammer, make a great number of *vertical* cuts into the bark, all round near the base of the trunk, they then set fire to the tree below the cuts, and having thus killed it, they leave it for *two* years before they collect the dammer, they say that after one year only the quantity of dammer is *much* less than after two years. The tree is killed in the hot season and the dammer is collected in February or March. When on the ghats previously, as well as this year, we were struck on looking towards the forests on both the Eastern and Western slopes as high as 3000 feet above the level of the sea, by numbers of trees with bright red, often crimson foliage, contrasting strongly with the various greens around. These crimson trees, are black dammer trees; the color due to the young leaves disappears gradually in April.

The leaves of the young plants are more sharply serrated than those of the old trees, and they have tufts of hairs all around the edges, which are not visible in the leaves taken from the old trees.

The *white dammer* tree has much the same *tenue,* trunk round and straight branching at 20 to 30 feet from the ground, its appearance is however sufficiently different. The trunk of the black dammer tree is smooth and whitish: that of the white dammer tree is (in all the specimens I saw) beautifully variegated by variously colored lichens, red, white, green, and black, the latter generally prevailing. The trunk also is *dimpled* all over by the scaling off of small patches of the bark. I am told that the young leaves are also reddish but not nearly so bright as those of the black dammer tree. The white dammer is obtained in the same manner as the black dammer, but the quantity obtained from one tree is generally little more than one third of that from a black dammer

* Collected personally by J. Brown, Esq., Astronomer in charge of the Trivandrum Observatory.

† The specimen was identified as the *Canarium strictum,* Roxb.

‡ This curious circumstance will doubtless account for the mode of formation of the resin called in Burmah "Poon-yet" and "Poey-ne-yet," specimens of which were exhibited at the Madras Exhibition and are said to be found in the ground, and were supposed to be produced by some hymenopterous insect; it is also found in hollow trees. This substance, although composed chiefly of a yellow brittle resin mixed with more or less sand or earth, has an appearance precisely like that which would be looked for if used by an hymenopterous insect in the construction of its cells (See classified Catalogue of the Madras Exhibition of 1857, class iv.) The Madras Exhibition of 1855 contained a substance from Malacca called "*Dammer klootee*" which had been evidently formed in the same manner, although the cells were larger and the resin blacker and harder than the Poonyet.

tree of the same size. The quantity obtained from a black dammer tree may be about 30 to 40 dungallies."*

Kistniah, Assistant supervisor of the Coimbatore district, writing from Suttymungalam, says, † " Both the white and black dammer trees grow in these forests, but the black are by far the most numerous, being in the proportion of ten to one white dammer tree. Both trees have the same appearance, growing to the height of 10 or 12 yards of one uniform thickness, and then branching like a jack tree. The dammer is extracted from the black dammer tree by piling firewood to the height of one yard around the base of the trunk and lighting it. The dammer subsequently exudes from the trunk as high as the flames reached. The operation is conducted at any season of the year, and the dammer continues to flow for *ten* years between the months of April and November and is collected in January. The tree after having yielded dammer for 10 or 12 years decays. The white dammer tree is not acted on by fire but the resin exudes spontaneously, and is found at the foot of the trunk, it is not much sought after by merchants."

Mr. Pedre Proboo ascribes the different appearance of various specimens of this resin to the age of the tree. The most vesicular specimens he says are obtained from the young tree, the more compact ones from the mature plant whilst the darkest colored kinds are obtained from the heart of the tree when decayed and split with old age. To sum up in a few words :—

The whole of the substances commonly called " dammers" produced in the Madras presidency are obtained from trees of the genera *Vateria, Canarium, and Shorea or Vatica.*

The two former, viz. Vateria and Canarium, yield by far the largest part (if not the whole) of the dammers produced on the Western coast of the Peninsula, whilst the Shoreas or Vaticas yield the greater part of that collected in the northern and eastern districts.

They may be briefly arranged as follows :—

Dammers of the Western Coast.

No. 1. *Black Dammer.* (*Canarium strictum*), the *carpoo coonghilium* of Ainslie, the *Dammara nigra legitima* of Rumphius, and the *Canari* of the Malays.

Occurs in large stalactitic-shaped masses of a bright shining black color when viewed from a distance, but translucent and of a deep reddish brown when held in thin laminæ between the eye and the light. It is perfectly homogeneous, and has a vitreous fracture. Its shape appears to be due to the fact of the balsam having exuded in a very fluid state and trickled down the trunk of the tree, where it gradually hardened by exposure to the sun, the fresh resin continuing to flow over that already hardened, gives rise to the stalactitic appearance of the huge lumps of resin, the outside of which much resemble the guttering of wax caused by placing a lighted candle in a draught. It is insoluble in cold, but partially soluble in boiling alcohol on the addition of camphor, when powdered it is readily soluble in oil of turpentine. Powdered and burnt on the fire it emits a more resinous smell and burns with more smoke than white dammer.

The size of the lumps of this resin, together with its color and the peculiarity of shape already mentioned, suffice to distinguish it from other Indian resins.

No. 2. *White Dammer or Piney resin* (*Vateria indica and allied species*) of Linnæus and Wight. *Choloroxylon dupada* of Buchanan and Ainslie, the *Doopada* resin of Mysore, and the *Payanee* or *Piney* of the Malabars.

Variety 1. *Compact Piney resin, or first sort white dammer.*

Occurs in large lumps of all shapes and varying in color on the outside from a bright orange to a dull yellow, bearing evident marks of having adhered to the bark of the tree. It has a shining vitreous fracture, is very hard and bears a great resemblance to amber. Its color (internally) is of all shades from a light green to a light yellow, the green tint predominating in the generality of specimens. It is more soluble in alcohol than the black dammer, and burns with less smoke and a more agreeable odour.

It is easily distinguishable from all other Indian resins by its superior hardness, its color and amber-like appearance.

Variety 2. *Cellular Piney resin, or second sort white dammer.*

Occurs either in small lumps or in large masses, generally of a shining appearance and balsamic smell. Has a very cellular structure,

* A dungally is a measure of about $2\frac{1}{2}$ seers.

† Both the white and black dammer trees have been recognised (by the specimens) as the *Vateria* and *Canarium*, although the black dammer sent from this district to the Exhibition was erroneously attributed to the *Vatica tumbugaia* by the exhibitor.

which is attributable partly to the mode of collection, and partly to the age of the tree. Notches being cut in the trunk of the tree sloping inwards and downwards, the resin collects in the cavity and is either permitted to dry on the spot, or is collected and dried by the application of heat. It is of all shades from light green to light yellow or white and is usually translucent. Specimens are sometimes seen in which, from the desiccation having been improperly conducted, the resin is more opaque, of a dull green color and full of air bubbles, presenting the appearance of having undergone a partial fermentation.

This resin may be recognised by its cellular appearance and balsamic smell—this latter however (which is of course due to the volatile oil it contains) is gradually lost by long keeping or constant exposure to the air.

On splitting open old and decayed trees, portions of a dark colored resin, having the solid consistence of the first variety, but the inferior quality of the second, are often found.

DAMMERS OF THE NORTHERN AND EASTERN DISTRICTS.

No. 3. *Saul tree dammer.* (*Shorea robusta and other species*).*

Occurs in sticks much resembling in shape the black dammer, but differing widely in color and consistency. In color it varies from a light yellow to a dark brown, the two colours being very frequently blended in the same lump and giving it the appearance of having a regular "grain." It is friable and differs from the white dammer of the Western coast in its inferior hardness, its opacity and its peculiar form, and from the black dammer in its color.†

The Jury now proceed to remark upon the quality of the specimens exhibited.

Lac. The chief value of stick lac consisting in the dye it affords, it will be found treated on at length under the head of "Dyes." As the resin is however used to a limited extent in the manufacture of varnishes, bangles &c. a few specimens are here noticed.

Good stick lacs are shown from Malabar, Bellary, Mangalore and Pegu. Also an excellent series of stick, seed and shell lac with the dye from Mirzapore, Kymoor and Hazaree baugh jungles from Claud. H. Brown, Esq. for which honorable mention is awarded.

The Madras Chamber of Commerce also show a very interesting series in illustration of these commercial products.

Piney resin or white Dammer (*Vateria Indica*). Of the many specimens exhibited the best is that shown by E. B. Thomas, Esq. of Coimbatore. It has the amber-like appearance of the best description of Vateria resin. Another specimen closely approaching to this in quality is exhibited by Pedre Proboo of Mangalore. He also exhibits a series of specimens of this resin of various qualities and a cake of the inspissated juicc of the same tree, which is used for mixing with bees wax in making candles. Honorable mention is awarded to this series.

Messrs. Binny and Co. exhibit a box of Piney resin of No. 2 variety.

Mr. Bassano, Tahsildar of Wynaad, exhibits a bottle of the fresh resin, or as it is called Pynie *varnish.* It is of a light grey colour, with a strong balsamic odour. This specimen is accompanied by a few of the leaves and fruit preserved in a bottle of salt water, a precaution which cannot be too much commended as it enables the jury at once to set at rest any doubt which may arise as to the actual tree which yields the product exhibited. The Jury award honorable mention for this specimen.

The Tahsildar of Walloo-wanaud in Malabar forwards another series varying in color from white to black. The Exhibitor observes that the resin which first exudes is called "*Chengilium*" (this is white) that which flows subsequently is termed "*Coongilium*" (darker than the above) and when the tree has decayed it is called *Dammer* (black). He describes the three sorts as being the produce of the Paynee tree (*Vateria.*)

Mr. Thwaites of the Government Botanical Gardens at Paradenia in Ceylon exhibits a fine specimen of *Doona dammer* obtained from a Dipterocarpus tree discovered by the exhibitor

* An intelligent native correspondent writing from Gopalpore says:—"There are extensive tracts of Googulam (*Vatica*) jungles in Goomsur and Cuttack provinces. The Khoonds and Woodias living in and near these jungles, wound trees in several places. The resin issues and is collected when sufficiently solid. The Dammer collected from the decayed parts of the tree is of a dark color, the tree is called "Guggilam" in Telugu and "tala gotso" in Urya. The Khoonds and Uryas make these leaves into the plates from which they eat their food, and also roll up tobacco in them to smoke like a cheroot. In time of famine the above tribes live on a soup made from the fruit of this tree."

† The vatica tumbugaia grows also to a limited extent on the West coast, but yields little if any of the dammer collected there.

and named by him *Doona Zeylanica.* The Jury award a 2d class medal for this highly interesting product which in color and appearance much resembles pine resin.

Poon-yet. Specimens of this curious substance are exhibited by Dr. Cleghorn and the Honorable W. Elliot, Esq. They were brought from Burmah, and arc said to be produced by a species of hymenopterous insect in holes in the ground and hollow trees. Indeed the cellular structure of the specimens much resembles that of a wasp's nest. A circumstance so unusual rendered the Jury at first somewhat incredulous of the correctness of this statement, but in the course of the investigations into the origin of the dammers of the western coast, it was incidentally mentioned that a species of bee appeared exceedingly fond of the liquid dammer of the *Canarium,* this insect lives in holes in the ground, and it will probably be found on inspection that its cells are composed of a similar substance to that now under consideration.

Kino (Pterocarpus marsupium). The several specimens of kino said to bc the produce of the Pterocarpus marsupium agree in being but slightly astringent, of a vitreous fracture and very decp red color approaching to black. The finest specimcn is that exhibited by Dr. Waring, run in a bamboo; a fair sample is contributed by Pedre Proboo.

A specimen of kino (?) from Bangalore (run in reed) is prismatic and conchoidal in its fracture and excessively astringent, it is most probably a superior kind of Catechu.

The Madras Chamber of Commerce show two specimens of dragon's blood, one in lump and one in reed, neither are astringent.

Palas or Dhak kino. (*Butea frondosa.*) Is shown by several exhibitors; the best is from Guntoor.

Dikkamalay. (*Gardenia*). Of the Gardenia resins the best specimen is that shown by Apothecary Huffton of Salem.

Benjamin. The Madras Chamber of Commerce exhibit two excellent specimens of Benjamin, of which the Siam appears to be superior in fragrance to the Sumatra product, although both possess a delightful aroma, they are of the amygdaloid kind, the latter being almost entirely composed of agglutinated white tears.

Gunda faroza (Boswellia thurifera). Is largely used in some parts of India as an application to indolent ulcers and wounds, and is supposed to form the chief ingredient of "Wroughton's ointment." It has the odour, taste and consistence of a balsam.

Theetsee. (*Melanorrhœa usitata.*) The celebrated *theetsee* dammer is exhibited by Dr. Brandis from Pegu and Capt. Benson from Moulmein. The latter exhibitor also forwards a half log of the tree which is probably the first ever imported into Madras.

Gamboge.—Excepting the specimens exhibited by the Chamber of Commerce, the samples of this drug do not call for special remark.

Xanthoxylon triphyllum. A very small quantity of the resin obtained from this tree is exhibited by the Rev. Mr. Johnson of Cottyam. Judging from the specimen it appears to be produced in two small quantities to be useful in a commercial point of view, but the jury award honorable mention for the carefulness of the exhibitor in indentifying the plant and supplying the correct botanical name of this new product.

Googool.—Four specimens of this gum resin, which is chiefly used as a medicine, are shown from Mangalore, Madura, Paulghaut and Bangalore.

Elastics.

This section contains no product which has not been exhibited and commented upon at the former exhibition. A detailed description of the Palee or Pauchauntce tree has been drawn up by the late Charles Drew, Esq. and may be referred to in the Literary Society's Journal.

The Moringa gum much resembles tragacanth, although its partial elasticity has caused it to be classed amongst the elastics. No use is known for this abundant product.

Gums properly so called.

Acacia gum.—The best samples of this gum were those from Guntoor (V. Jugganaikooloo), from Madras (Venkataramiah Garoo) and from Hydrabad.

Ægle marmelos.—A good specimen of the gum of this tree was exhibited by Dr. Ratton of Chingleput.

Cashew tree gum (*Anacardium occidentale*) — Armooga Moodelly of Chingleput forwards a very fine specimen.

Azadirachta Indica.—Of the numerous specimens of margosa gum forwarded for exhibition, the only ones which require notice are those from the Pondicherry Local Committee and from R. D. Parker, Esq. of Madura.

Kuteera.—The produce of the *Cochlosperum gossipium* much resembles tragasanth, only two samples are shown.

Wood apple gum.—(*Ferorium elepantum.* This is one of the best gums included under the general name of *gum arabic.* Kristniah of Coimbatore exhibits the best specimen. Good samples are also sent from Bellary, Cuddapah and Pondicherry.

None of the other articles of this class call for special notice. The Jury would recommend a second class medal to the Madras Chamber of Commerce for the valuable and interesting series furnished by them.

Mr. Hunt of the American Mission Press also exhibits a specimen called "Gum Hog"—It is a product of S. America and resembles tragacanth.

AWARDS.

SECOND CLASS MEDAL.

Madras Chamber of Commerce, for a series of Resins &c. in illustration of the best articles of commerce

Mr. Thwaites Ceylon. Doona dammer.

Honorable Mention.

Claud. P. Brown, Esq.	For a series of lac resins.
E. B. Thomas, Esq.	Vateria resin.
Pedre Proboo.	A series of white dammer.
Mr. Bassano.	Pynee varnish and botanical specimen.
Apothecary Huffton.	For Dikkamly.
Rev. Mr. Johnson.	Xanthoxylon triphylum resin.
Armooga Moodelly.	Cashew gum.
E. T. Waring, Esq.	For information given

H. P. HAWKES, LIEUT.
Reporter.

SECTION II.

OILS.

SUB-JURY.

Dr. G. W. FLYNN, G. M. M. C. *Reporter.*
Lieut. H. P. HAWKES.
H. F. C. CLEGHORN, ESQ., M. D.

The extensive application of Oils in the Arts and manufactures have given them a considerable commercial importance. Some are also used as articles of Food ; others for burning in Lamps ; but the greatest demand is, in the preparation of Wool ; for manufacturing Soaps ; Candles ; and Lubricating compounds for machinery. They are used largely also in making Printer's and Lithographic Inks, and in printing Piece Goods, &c. &c.

From India a very large quantity of Oils and Oil Seeds is annually exported to Great Britain and France ; and the demand seems to be increasing than otherwise. The principal Oils, and Oil Seeds exported are the Cocoanut, Gingellie, Ground Nut, Mustard, Castor and Linseed. Illapoo only in small quantities.

The following Table shows the quantity annually exported for the last five years:—

Statement showing the quantity of Oil and Oil Seeds, Exported from the Madras Territories by Sea from 1852-53 *to* 1856-57.

	ARTICLES.	1852-1853.	1853-1854.	1854-1855.	1855-1856.	1856-1857.
		* Gallons.	Gallons.	Gallons.	Gallons.	Gallons.
Oils.	Castor, ...	8,059	7,818	...	21,604	33 397
	Cocoanut, ...	14,57,741	17 97,450	21,41,548	20,62,757	22,60 749
	Gingellie, ...	72,607	1,19,180	15,963	45,381	72,431
	Ground Nut, ...	57,207	82,886	45,125	1 48,806	63,398
	Illappoo, ...	...	...	...	...	1,637
	Linseed, ...	...	...	..	...	2,827
	Mustard, ...	...	...	..	..	...
	Rape, ...	...	...	..	...	...
Seeds.	Cocoanut, Dry, ...	Cwt. 1 51,528	Cwt. 1 22 642	Cwt. 92,412	Cwt. 1,12,805	Cwt. 1,10,814
	Castor.	Cwt. 2 764	Cwt. 15,475	...	E. Qrs. 3 461	E. Qrs. 1 862
	Gingellie, ...	Cwt. 2,51,613	Cwt. 3,03,579	E. Qrs. 37,481	E. Qrs. 1,00,767	E. Qrs. 1,14 381
	Ground Nut, ...	...	...	E. Qrs. 72	...	E. Qrs. 800
	Illappoo, ...	...	...	...	...	...
	Linseed, ...	Cwt. 1,106	Cwt. 2,898	E. Qrs. 293	E. Qrs. 310	E. Qrs. 1,158
	Mustard, ...	Cwt. 16,075	Cwt. 18,028	E. Qrs. 894	E. Qrs. 4,182	E. Qrs. 2,106
	Rape, ...	...	...	..	...	...

The *sources of Oils* are very extensive, they are derived from the three Kingdoms of nature. The Animal, Vegetable, and Mineral. The Animal Oils are Lard, Tallow, Cod, Skate, Shark, Sperm, &c. &c. Some of these are found in the cellular tissue immediately beneath the skin and between the folds of the lining membrane of the abdomen, others in the Liver ; and in the Whale, in a triangular cavity in the head. The Oil in all the above cases is contained in distinct cells ; and each cell has its Blood vessels.

The Vegetable Oils are obtained, from the Seeds as Castor, Croton, Gingellie, Ground Nut, Linseed, &c. &c. ; from the Fruit, as the Olive ; from the rind and leaves, as the Orange, Lemon &c. from the Flowers as the Neroli and Lavender ; and from the roots and wood as Sassafras, Sandal. &c.

The proximate constituents of an Oil, are *Stearic, Margaric,* and *Oleic acids,* in combination with *Glycerine.* From *Stearic acid* is prepared the *Stearine* used in candle making, it is the most solid constituent of an Oil, and in proportion as this ingredient preponderates, so is the value of the Oil for candle making increased. The next in solidity is *Margaric Acid.* And the fluid constituents are *Oleic Acid and Glycerine.* These latter ingredients are of value to the soap boiler and for burning.

The *modes* of extraction vary with different

* 1 Ton. 210 Imperial Gallons.

circumstances, and it would be too laborious to enter into the several processes in detail. In the case of Lard, Tallow and other Animal fats, the general process is to boil the Cellular tissue containing the Oil in water, the heat and moisture rupture the cells, and the Oil escapes floating on the top liquefied by the heat, sometimes a little sulphuric acid is added to facilitate the destruction of the membrane forming the Oil cells ; another process is to enclose the Cellular tissue in bags made of Horse hair or of some other strong material. These bags are warmed and subjected to powerful pressure by machinery. The fat Oils contained in the Liver are obtained by cutting up the Liver into small pieces and boiling, the Oil rises to the top, and is skimmed off, it is afterwards purified by filtration. This is far the better way of procuring the Oil than to allow the Liver to putrefy, and the Oil to exude from disintegration of the cells by putrefaction.

The *vegetable fixed Oils* are best obtained by crushing the seeds or fruit between Iron rollers and submitting the bruised mass to the strong pressure of an Hydraulic, or Screw Press. The bruised mass may be submitted to a slight heat, but not to moisture. The heat will facilitate the exudation of the Oil, but should moisture exist, the Oil then becomes impregnated with a good deal of colouring matter, which is difficult to remove by any subsequent mechanical or chemical process. The Oil is said to be *Cold drawn*, when obtained by pressure ; and *Hot*, when by boiling, or when presure is aided by heat and moisture. In the former case, the Oil must be clarified, as it contains a quantity of Albuminous and Mucilaginous matters ; these are got rid of by gently boiling the Oil with a small quantity of water, taking care not to raise the heat beyond the boiling point of water, nor to continue the boiling after the water has been dissipated. This process coagulates the Albumen and Mucilage which become precipitated in lumps carrying with them all other impurities. If the process of pressing and clarifying have been conducted with cleanliness and care, the oil ought to be clear and colorless. The hot process gives a greater yield, but the oil soon becomes rancid and is never colorless.

The *drying Oils* undergo a further process, which is of a chemical nature; such oils before they can be used in the arts, must be thoroughly deprived of all mucilaginous matters, and brought into a state which will increase their affinity to combine with oxygen when exposed to the air in a thin stratum. This is effected by further boiling and adding from time to time the *Basic Acetate of Lead*, this chemical reagent combines with the mucilage and forms with it a new compound, which is thrown down. The boiling is continued briskly, and the heat allowed to reach to such a degree as will scorch or frizzle up a feather when dipped into the boiling oil, when the heat has arrived to this degree, it is allowed gradually to subside, and when cooled down, the oil is drawn off clear, allowed to repose in large cisterns until no further deposit takes place and it becomes clear and transparent, when it is fit for use. The older the oil, the better its drying qualities. There are other processes given which are considered as improvements, but from actual experiments in India, the above process has been found the most successful.

The *wood* oils, are obtained by tapping the trees which yield them, and are principally the produce of the *Dipterocarpus* family. The process consists in making a large notch in the trunk of the tree, a few inches from the ground ; heat is applied until the wound is charred and the oil begins to exude ; a channel is cut from the notch leading to a receiver for the purpose of collecting the oil as it flows. The average yield of a tree in each tapping season, is said to be from 30 to 40 Gallons. These oils possess the double character of a fixed oil, and a volatile oil. The volatile portion is Balsamic or of the character of liquid resin, hence their usefulness as varnishes. The wood oils from Burmah yield on distillation a clear straw colored liquid Balsam, having in some respects the chemical and physical properties of Balsam of Copaiba, and like it also in medicinal properties, particularly, in the treatment of gonorrhœa, in which disease it is said by those who have tried it to be far more potent than the Copaiba Balsam.

Since the above was written, the oil sold in the Bazars, without submitting it to any further preparation than that of filtering, has been tried in cases of gonorhœa and the result of the trials has been very satisfactory. It answers as well, if not better, than the Balsam Copaiba.

The *volatile oils, essences,* or *utturs,* are generally distilled ; few are pressed, such as Lemon Oranges and Citron. The distillation is carried on in large Copper Stills ; the fruit, seeds, leaves, flowers or the whole plant is put into the body of the still, and as much water is poured on as to cover the article to be operated upon ; on the application of heat, the water impregnated with oil distils over and is collected in a receiver. The oil either floats on the top, or if heavier than water, as Clove oil, it sinks to the bottom. In distilling oils heavier and less volatile than water, the heat must be above the boiling point of water, and to obtain this increased temperature common salt is added to the water to increase its capacity for taking in heat, otherwise the oil will not distil over. These oils are principally used in perfumery and medicine ; few are used in the Arts as solvents of resins.

In considering the qualities of the several oils exhibited, it will be found convenient to adopt the following classification. Those marked in Italics are not considered of any commercial importance from the small quantities in which they are procurable ; many of them, may in all probability hereafter be found to possess some valuable properties as Medicinal Agents, or of some application in the Arts ; but this can only be determined by experimenting on each oil. Samples of the whole of the oils might with considerable advantage be placed in the hands of some scientific person to investi-

gate and report upon their Physical, Chemical and Medicinal properties ; the points of research should embrace *Specific weight, Color, Consistence, Behaviour with Chemical re-agents, Properties* and *value* as *Lamp Oils* and *Gas yielding Oils, Medicinal properties, Application in the Arts* and *Sciences* &c. &c. such information collected in a Tabular form would prove invaluable.

The oils in the classification here adopted, are first divided into three great classes according to the Kingdoms of nature from whence they are derived. Class I. *Animal,* Class II. *Vegetable,* and Class III. *Mineral.* No division is made of Class I. nor III., but Class II. is divided into three sub-classes. The first includes all *Fixed Oils.* The second, *Volatile Oils, Essences,* or *Utturs.* And the third embraces the *Wood Oils* or Oleo-balsams. Sub-Class I. is again divided into two groups. The first contains the *Fat Oils* and the second the *Drying Oils.*

CLASS I.—ANIMAL OILS.

Ghee.	*Frog's fat.*		Muthi Yeno.
Hog's lard	*Peacock's fat.*		Frictzi.
Mutton Suet.	Karahmanoo FishOil.		Karitze malu Oil.
Boar's Grecse.	Chadoo pareeger	„	Serinei Shark Liver Oil.
Deer's lard.	Cooawanoo	„	Chellei nei.
Wax Oil.	Goodee	„	Amaci nai, (Turtle Oil.)
Tiger's fat.	Valager	„	
Egg Oil.	Moosoo	„	
Wild Serpent Oil.	Bochee	„	Fish Liver Oil.

CLASS II.—VEGETABLE OILS.

SUB CLASS 1.—*Fixed Oils.*—Communicating a permanently greasy stain to Paper or Cloth.

GROUP 1.—*Fat Oils.*

Cocoanut	Oil.	*Margosa*	„	*Neeradimooloo.*
Gingellie	„	*Pecnacottay*	„	*Country, Cress.*
Castor	„	*Kurring*	„	*Cheeronjie.*
Ground Nut	„	*Coorookoo*	„	*Cucumber.*
Mustard	„	*Physic Nut*	„	*Melon.*
Rape	„	*Piney Tallow*		*Pumpkin.*
Ramtil	„	*Gamboge Butter.*		*Colocynth Seed.*
Cashew Nut	„	*Malkungunee.*		*Momordica Charana.*
Belgaum Walnut.		*Hemp seed.*		*Pertrnnjie.*
Safflower	„	*Viscid Cleome.*		*Mooroogana.*
Ben Nut	„	*Cattappa Oil.*		*Naga Sumpaghee.*
Croton	„	*Googoo.*		*Soap Nut.*
Marking Nut	„	*Moodoga.*		*Vernonia Anthelminica.*
Cotton Seed	„	*Nux Vomica.*		
Illapoo	„	*Poovana.*		*Karingola.*

GROUP II.—*Drying Oils.*

Linseed Oil.	*Poppy Oil.*	*Hempseed Oil.*

SUB CLASS II.—*Volatile Oils.* Do not communicate a permanent stain to Paper or Cloth, the Greasy stain is dissipated by heat.

Anise.	Bishop's weed seed.	Orange.
Camphor.	*Sweet fennel.*	Lemon.
Lemongrass.	Rousa oil.	Sandal wood.
Pumplemose.	*Cummin oil.*	*Coriander.*
Pepper.	*Fennel flower.*	Cloves.
Nutmeg.	*Onions.*	

SUB CLASS III.—*Cleo-Balsams.*—Oils having the qualities of a fixed Oil and a liquid Resin.

Oils from the family of Dipterocarpus known as Wood Oil. Teak Oil &c.

CLASS III.

MINERAL OILS.

Petroleum from Ava.	Mud Oil from Mangalore and
Earth oil from Paulghat.	Earth Oil from Coimbatore.
Muner Ennai from Travancore.	

CLASS I.—ANIMAL OILS.

The Fish Oils are the only Samples of this class deserving of any notice ; that exhibited by Mr. Underwood, and by First Dresser Pareah Mooneyagum are excellent specimens, others are considered ordinary, and some very inferior.

Fish Liver Oil is now prepared in large quantities on the Western and Malabar Coasts for exportation. That supplied to Hospitals for the use of the Troops is prepared from the Liver of the Skate, Seer, and white Shark indiscriminately. From analysis and experiments made in England, it has been found to equal in its medicinal properties the best Cod Liver Oil, but from its extremely disagreeable taste and odour, it can never supercede the Oil of Newfoundland. A more agreeable kind of Oil may be prepared from the Livers of the Skate or Seer Fish ; but when the Liver of the Shark is also used with the Livers of the other fish, the Oil so obtained has a very offensive odour and unpleasant taste, and which cannot by any Mechanical or Chemical process be removed, however carefully it may be prepared.

CLASS II.—VEGETABLE OILS.

SUB CLASS—FIXED OILS.

GROUP I.—FAT OILS.

Cocoanut Oil, and Cocoanuts. Twenty four Samples of the Oil, and three of the Nuts are exhibited. On the whole the specimens are very good. That exhibited by Hurry Row of Tanjore, and marked No. 4561, in the Catalogue, and that by the Bellary Commissariat are considered best. Hurry Row's is somewhat superior to the other. Very good specimens are also exhibited by Mr. Kohlhoff of Tanjore, and Padre Probo.

Gingellie and Till Oil and Seeds. Twenty three specimens of Oil, and fifteen of Seeds. The Seeds are of all colors varying from White to Black. The best specimens are marked Nos. 1467 and 2055 in the Catalogue. The best Samples, of Oil are those exhibited by the Bellary Commissariat and Hurry Row of Tanjore and marked Nos. 2055 and 4554, respectively, in the Catalogue.

Castor Oil and Seeds. Nine samples of Lamp Oil, and nine of the large variety of Seeds from which the Oil is extracted, together with seventeen samples of the better sort of Oil called Castor Oil, and sixteen of the small variety of seeds are exhibited. Of the Lamp Oil, the samples shewn by Ramasawmy Chetty of Madras, and Hurry Row of Tanjore are very good. Of the large variety of seeds, that which exhibited by the Bellary Local Committee is the best. Of Castor Oil, and small variety of seeds that shown by Dr. Smith are the best.

Ground Nut (Arachis Hypogea). Eight Samples of the Oil, and six samples of seeds are exhibited. The specimens marked Nos. 5087, 4563, 5101 and 2259 are excellent, three are from Tanjore, and one from Nellore. The exhibitors are Mr. Prudhomme, Hurry Row and Mr. Kohlhoff of Tanjore and H. Young, Esq. of Nellore.

Ramtill. (Guizotia Oleifera). Nothing in this class deserving of particular notice.

Mustard. (Sinapis Species). Thirteen samples of seeds, both of the white and black variety are exhibited, of these Nos. 3044, 2251 and 4506 are considered best. Of the nine samples of oil No. 2251 shewn by H. Young, Esq., Nellore, No.

5110. Mr. Kohlhoff, Tanjore, and No. 4559, Hurry Row of Tanjore are very good. The whole of these samples must have been obtained by boiling, as they all, more or less contain the volatile oil of mustard, known by the hot taste of the oil. The oil obtained by cold pressure is not pungent and irritating because it is free of the volatile oil, which is formed only when the crushed mass comes in contact with water; when a peculiar chemical change is set up and the oil is formed.

Margosa (*Azadirachta Indica and Melia Azadirach*). The specimen exhibited by Mr. Underwood as Veppoo oil, is the best. This oil is used for burning in Lamps and as an embrocation. It is not manufactured in large quantities.

Illipoo (*Bassia longifolia*). The best specimen of this oil is exhibited by Mr. Underwood as oil fit for salad. It appears to be the thinner portion carefully filtered off from the thicker. There is an objection to its use as a salad oil however carefully it may be prepared, it has always more or less a bitter taste, and this unfits it for a salad oil. It is used in candle making and greasing machinery; and is as good, if not superior, to Palm oil for making soap.

Pinnacottay (*Colophyllum inophyllum*). Good samples of this oil are exhibited by Mr. Kohlhoff, Mr. Prudhomme and Hurry Row of Tanjore. This oil is not manufactured in large quantities,

Kurring (Dalbergia Arborea or Pongamia Glabra.)
Coorookoo (Argemone Mexicana.)
Physic nut (Curcaus Purgans and Jatropha Glauca)
Belgaum walnut.
Poovana.
Neeradimootoo.
Country cress (Lepidium sativum)
Cheeronjie (chirongia sapida or Buchanania latifolia.)
Cucumber. Melon and Pumpkin (cucurbita species.)
Momordica charanta.
Putrunjee(Putranjiva Roxburghii.)
Mooroogana Oil.
Naga sumbaghae (mesua ferrea.)
Soap nut (sapindus emarginates)
Malkungunee (celastrus paniculatis.)
Viscid cleome cleome viscosa.)
Terminalia Cattappa.
Googoo seed.
Colocynth.
Moodoga (Butea frondosa.)
Nux Vomica.
Veronia Anthelmintica.
Karinjota.

Of the foregoing twenty-two oils nothing of any interest can be noticed. The *malkungunee oil* is an empyreumatic oil obtained by the destructive distillation of the seeds, and in combination with other ingredients has been used in Beriberi. The *Nux Vomica* Oil is also obtained in like manner and used by native Practitioners; one or two others are also used medicinally by the natives, but they are not known in European practice.

Piney Tallow (*Vateria indica*) *Vegetable Tallow.*—A good specimen is shown by Padre Probo—This, if procurable in large quantities, would be valuable in Candle manufacture, as it burns without emitting much smoke, and the melting point is much higher than Tallow.

Gamboge Butter (*Garcinia pictoria*). A good specimen is exhibited by Padre Probo.

Safflower Oil (*Carthamus Tinctoria*). Good specimens are shown by the Bellary Commissariat from Hyderabrd, Kurnool, and by Hurry Row of Tanjore.—The best is from Kurnool. This Oil makes excellent soap, and would meet with a ready sale in the English market but is not exported in any quantity.

GROUP II. DRYING OILS.

Linseed (*Linum usitatissimum.*) Seven samples of oils and 9 of seed are exhibited, of the samples of oil that from Guntoor is the best, those exhibited by the Bellary Commissariat and Hurry Row are also very good. The seeds are also very good samples.

Poppy. (*Papaver sommiferum.*) Six samples of oil and nine samples of seed. That of Hurry Row of Tanjore is the best, the next in quality is No. 2264 forwarded by H. Young, Esq. of Nellore; the seed are all very good.

This drying oil is peculiarly adapted for making light colored transparent varnishes, but it is little known in India as a drying oil, the Poppy is not very extensively cultivated in Southern India.

Sub Class II, *Volatile Oils*—Do not communicate a *permanent* stain to paper or cloth; the greasy stain is dissipated by heat.

Anise,	Bishops weed seed	Orange.
Camphor,	Sweet fennel,	Lemon.
Lemon grass,	Rousa oil,	Sandal wood.
Pumplemose,	Cummin oil,	Coriander.
Pepper	Fennel flower,	Cloves.
Nutmeg,	Onions,	

Of the volatile oils exhibited the following are good samples and of commercial interest.

The Lemon grass oil from Travancore and Hydrabad and the Rowsa oil forwarded by Dr. Smith.

These oils are used as embrocations in Rheumatic diseases, the lemon grass oil is exported in large quantities from Ceylon to England, where it is extensively used in perfumery as oil of Verbena and oil of Geranium.

Sub Class IV, *Oleo balsams.*—Oils having the qualities of a fixed oil and a liquid resin.

Oils from the family of Dipterocarpus, known as Wood oil, Teak oil, &c.

CLASS. III.

Mineral Oils.

Petroleun from Ava,	Mud Oil from Mangalore, and
Earth Oil from Paulghat,	Earth oil from Coimbatore.
Munu Ennai from Travancore,	

AWARDS.

Second Class Medals.

To Hurry Row of Tanjore and Mr. Kohlhoff for the greater number of good Specimens of oils exhibited

Honorable Mention.

Bellary Commissariat for best Samples of Cocoanut, Gingilie and Safflower seed, oils.

Dr. Smith, for good sample of Castor oil and seed and for Rowsa oil

Hy. Young, Esq Nellore for excellent sample of several oils.

Padre Probo, for best sample of Piney Tellow and Gamboge Butter.

SECTION III.

DYES AND COLOURS.

Sub-Jury.

J. T. Maclagan, Esq. *Reporter.*
The Hon'ble W. Elliot, Esq.

Associates on Indigo.

R. O. Campbell, Esq.
J. D. Sim, Esq.
W. B. Liddell, Esq.
W. Sim, Esq.
P. Veerapermal Pillay.

INDIGO.

The most important of Indian dyestuffs, from the

quantity now exported, and from the extreme difficulty of deciding its value, is Indigo. It is extracted from various species of *Indigofera*, which are largely cultivated in various districts of Bengal, in the Cuddapah Collectorate of Madras, and other parts of this, and the Bombay Presidency.

The following Memo. regarding the cultivation and manufacture of Indigo, as carried on in the Benares Province, is written by Claud Hamilton Brown, Esq. of Mirzapore.

SOIL.

" The richest loam is supposed to give the best " *produce*, though lighter soils frequently give finer " looking *plants*. Moist low soils are not suitable, " but a great deal depends upon the Sub-Soil, as " the root grows vertically and to a great depth. " High stony lands are to be avoided, excepting " the sites of old villages, where from the presence " of Lime, and animal or vigetable matter, very " fine crops are frequently produced, particularly in " a season when the rains are heavy.

" Fields that have recently had heavy crops (Maize " (*Holcus*,) Indian corn (*Zea*,) Urhur (*Phaseolus*,) " &c.) recently taken off them should be avoided."

CULTIVATION.

" Immediately on the setting in of the periodical " rains, say 15 to 30th June (in these parts), the " lands should be well and carefully ploughed (3 " ploughings,) the seed thrown in broad cast, at " the rate of 4 seers (8lbs) per Beegah, and the " land smoothed over with a Henga, (rudimentary " Harrow.)

" The plant generally shews itself in 3 or 5 days. " As soon as it has got 2 or 3 Inches high with 6 " or 8 leaves, all weeds must be carefully removed, " and a second weeding is again requisite by the " time the plant is 6 or 7 inches high.

" While weeding, any places where the seed may " have failed to germinate, can be resown by " sprinkling the seed on the surface and dibbling " it in where required.

" In about 90 days, the plant begins to flower, " and is then ready for cutting.

MANUFACTURE.

" The plant is cut at about 6 Inches from the " ground, and carried to the steeping Vats with as " little delay as possible; strewn horizontally in the " Vats, and pressed down by means of beams fixed " into side posts, bamboos being placed under the " beams. Water must be immediately run in, suf- " ficient just to cover the plant. If water is not " at once let in, the plant will heat, and become " spoilt.

STEEPING.

" The time for steeping depends much on the " temperature of the atmosphere, and can only be " learnt by experience and careful watching of the " Vats, but it may be mentioned that in close sultry " weather, east wind, Therm. 96° in the shade, 11 " or 12 hours are sufficient. In dry cool weather, " west wind 15 or 16 hours are sometimes requisite. " If the plant is very ripe, the Vat will be ready " sooner than if the plant was young and unripe.

" It is most important to steep exactly the pro- " per time, the quality and quantity of your produce " being dependent on this being done. As a guide " the following signs may be mentioned, as showing " that the Vat is ready to be let off.

" 1st. As soon as the water begins to fall in the " Vat. 2nd when the bubbles that rise to the sur- " face burst *at once*. 3rd on splashing up the sur- " face water, it has an orange tinge mingling with " the green. 4th The smell of the water is also a " great guide; when ripe it should have a sweetish " pungent odour, quite different from the raw smell " of the unripe green coloured water. The first of " the water, when let off into the beating Vat, has " a rich orange colour; and from the depth of this " you can judge whether the Vat has been a pro- " per time steeping.

BEATING.

" This is performed by men who enter the water " (about 7 to each Vat), and agitate it either by the " hands, or by a wooden paddle, at first gently, but " gradually increasing as the *fecula* begin to sepa- " rate which is known by the subsidence of the " froth and the change of the colour of the water " from green to dark blue. The time usually " necessary for beating is from 1¾ to 3 hours, but " no positive rule can be given for this.

" The following are common modes of testing " the state of the Vat.

" 1st. Take a little of the water in a white plate " or saucer and let it stand. If the *fecula* subside " readily, and the water remains of a Madeira " colour, the beating may be stopped.

" 2nd. Dip a coarse cloth in the Vat and wring " out the water, observing its colour. If green, the " beating must be continued, but if Madeira or " brownish colour, it is ready.

" 3rd. When sufficiently beaten, the surface of " the water, will, as soon as the beating is suspend- " ed, become of a peculiar glassy appearance and " the froth subside with a sparkle and effervescence " like Champagne.

" Three or 4 chatties of cold water, or weak lime " water are then sprinkled over the surface, to " hasten the precipitation of the *fecula*, which does

" not completely take place in less than 3 or 4 " hours. The water must then be drawn off from " the surface, through plug holes made for the pur- " pose, in a stone slab inserted in the wall of the " vat. The *fecula* remaining at the bottom are re- " moved to the boiler.

BOILING.

" Bring it to the boiling as quickly as possible " and keep it there for 5 or 6 hours while boiling " it must be stirred to prevent the Indigo burning " and skimmed with a perforated ladle. It being " sufficiently boiled is known by its assuming a " glassy appearance.

" When sufficiently boiled it is run off to the " straining table, where it remains 12 or 15 hours " draining, it is then taken to the Presses and *gra- " dually* pressed this takes 12 hours. It is then " ready to be taken out, cut, stamped, and laid in " the drying house to dry.

" A good size of steeping vat is 16 feet by 14 " by 4⅓ the beating vat to be somewhat smaller " and shallower.

" A Beegah contains 27,224 feet. 200 Ms. of " plant do very well if they yield one Maund " (82 lbs.) of any Indigo, a vat of above size holds " about 100 Ms. of Plants.

" The plant sown say in June July, is cut 3 " months afterwards (*Now-dah*) and manufactured ; " and a second crop will be taken from it the fol- " lowing " *Khoontee*" (August.) The second cut- " ting gives the largest produce and best quality. " The third " Teersalee" but it is seldom allowed " to grow three years."

Of this important dye there were exhibited 83 specimens, besides a collection from Bengal, belonging to Government, and forwarded through the Board of Revenue, which did not enter into competition. After a careful examination of the specimens the following were selected as being superior.

GREEN LEAF.

Jury No.	Exhibftion No.	Character.	Exhibitors.	Remarks.
40	5760	Sq, Tender paste, fine violet.	Binny & Co.	[Finest.
49	5767	Sq. Tender paste, violet, little elose............	Appasawmy Pillay &Co	Deeidedly Slightly inte- rior.
41	5761	Sq Tender paste violet.	Binny &Co.	Equal.
43	5763	Sq. Closish, reddish violet, tender paste	Do.	
48	5767	Sq. Tender paste violet red violet.....	Appasawmy Pillay &Co.	
71	5775	Sq. Tender paste, strong red violet...	Lecot Hicks & Co.	

DRY LEAF.

JAVA.

81	5947	Sq. Tender paste, red violet	Chamber of Commerce

VELLORE.

70	5774	Broken, soft, tender paste, red violet.	Walker & Co.	Nearly equal to No. 81.

No. 80-5743 manufactured by Mr. Fischer of Salem was considered deserving of honorable mention.

Of Pondicherry Dry leaf there was no first rate specimen. Nos. 18 exhibited by Soobroy Pillay and 17-9174 exhibited by Mootoosawmy were considered creditable.

It may be remarked that previous to the Jury commencing their labors, the Nos. and marks were obliterated from the different specimens, and a Jury No. affixed, corresponding with the Exhibition No. and known only to the Reporter, who took no part in the examination of the specimens, but simply recorded the opinions of the Associates.

ASSOCIATES ON THE OTHER DYES.

B. Chengelroy Chetty, *Dye Merchant.*

S. Chengelroy Chetty, *Dyer.*

T. Mootoosawmy. *Dyer.*

CHAY ROOT.

Siru Ver. Tam. சிறுவேர்.

Chiri Veru, Tel. చిరివేరు.

This is the produce of a herbaceous plant belonging to the natural order *Rubiaceæ*, the *Oldenlandia umbellata*, common in sandy soils along the Coromandel coast. The dye is obtained from the roots, which are long, much divided, and slender. The plant is found both wild and cultivated.

Specimens were exhibited from Nellore, Chingleput, Tanjore, Madura and Malabar.

The best samples were from Chingleput and Tanjore which were classed as follows.

Chingleput, best quality, fit for dyeing twist of a fine bright red colour exhibited by *Yanadis* (a wild jungle race) of Striharicotah.

Second Quality.—Nos. lost, supposed to be of the same origin as the last, which it nearly equals but is somewhat inferior.

Tanjore. Inferior to the last but will yield a good colour for twist. Exhibited by R. Hurry Row.

Exhibition No.	Local Committee No.	
4527	249	Tanjore—like the last but inferior; same exhibitor.
4522	251	Do. much inferior, not fit for twist; will only serve to dye cloths. Same exhibitor.
4529	250	Do. Do. not so good as the last; same exhibitor. The above are all large, full samples. Those that follow are in small bundles and of still worse quality.
2694	,,	Malabar. } Pretty nearly alike, the first somewhat superior but all yielding a pale shade of red and only suitable for dyeing cloths, not fit for thread.
,,	$\frac{28}{2}$	Madura. }
,,	$\frac{28}{3}$	Do. } About equal, inferior to the last.
,,	$\frac{28}{4}$	Do. }
5705	,,	Nellore from Inamanellore Talook.
1151	$\frac{28}{1}$	Madura. } Very inferior.
,,	$\frac{28}{5}$	Do. }
1430	71	Bellary. Inscribed *Cherongia Sapida* and exhibited by

the Tahsildar of Anantapoor who has named it erroneously perhaps from the resemblance of its Telugu name to the original (Buchanans) designation of the *Buchanania latifolia.* This specimen consists of a small bundle of thick woody roots which are of no value in the market. Although this specimen was recognized by the Dyers as being a true chay-root, the marked difference between its appearance and that of all the other specimens leads to the supposition that it may be derived from some other plant. The native dyers assigned the first place to those specimens which yield the deepest red and which are employed for dyeing thread before it is taken to the loom. This is woven into handkerchiefs which were formerly in great demand under the name of Pulicats. A considerable number are still exported to the Dutch market chiefly to Antwerp. Others, particularly those with patterns in which the chocolate tint is found, and known as Madras handkerchiefs go to the West Indies and the Southern states of America through the port of London. They are much prized by the Negroes. The Corge of 20 pieces, each piece containing 20 handkerchiefs, which used to be bought for 175 Rupees, contract price, from the weavers, and was sold to English houses for 200 to 220 Rupees, has now fallen to 120 Rupees contract price.

In Madura the paler tint seems to be preferred according to the statement of the Madras Dyers, and the same inference may be drawn from the circumstance of such specimen, classed by them as the worst, being numbered 28 by the local Committee. The cloths dyed at Madura, after they are woven, are exported in considerable numbers, for the consumption of Madras. The *Chay* root in this case is mixed with *noona* or *Morinda* bark.

The other colours dyed with the *chay* are 1st Chocolate which is obtained by the subsequent application of the *poppade*, *papli cheka* or *surul patta* (to be noticed next) to the red obtained from the chay. It is much prized in the bandana or Pulicat handkerchiefs exported to the West Indies.

2. By the addition of a salt of iron mixed with syrup, a fast black colour is obtained, but this is only fit for printing chintzes, and is never used for dying thread, which would be rotted by the process.

3. A very fine red is produced by adding safflower (*Kusamba*) with Lime juice, and soda, (Dhobis earth), but this is not a fast colour. The best mordant, and that always used is alum.

The following particulars regarding the cultivation aud produce of chay root, may not be uninteresting.

The *Oldenlandia umbellata* grows spontaneously in sandy soils throughout the Carnatic, but more particularly along the Coromandel Coast. The root of that which grows wild is reckoned the best, but it is also cultivated to some extent. The districts in which it is most largely produced are Rajahmundry, Masulipatam, and Guntoor. It is also obtained in Nellore, South Arcot, and Tanjore, but the information at present available, is only for the three first mentioned.

For the cultivation of the plant the finest sandy soil is required, as being the most favorable to the free growth of the root, on the length of which the value of the article greatly depends.

The cultivation commences in the end of May, or beginning of June, with the first falls of the S. W. Monsoon. During the space of three months the sand is subjected to repeated ploughings, and is thoroughly cleaned from all weeds. Between each ploughing it is manured, and after the last ploughing it is levelled with a board, and formed in small beds of about 6 feet by 3.

The seed which is extremely minute (so much so that it is impossible to gather it except by sweep-

ing up the surface sand into which it has fallen at the end of the harvest) is then sown, by spreading a thin layer of sand over the prepared beds. They are then kept constantly moist and are watered gently with a sieve made of palmyra fibres, five or six times a day ; care being taken that the water is quite sweet and fresh, for which purpose it is obtained from wells newly dug in the field.

At the end of a fortnight the seeds under this treatment will have germinated freely, after which, the young plants are only watered once a day, in addition to which, liquid cowdung, greatly diluted with water, is daily sprinkled over them.

At the end of two months the plants will have attained nearly their full height, but mixed with weeds of *Mollugo cerviana*, and *Spergula*, *Trianthamum*, various kinds of *Cyperaceæ* and other sand loving plants. These must be carefully removed, and the beds watered again if required.

In about four months more, or at the end of six months from the time of sowing, provided the season has been good, and the falls of rain regular, the plants will have reached maturity, and the roots be ready for digging. But no artificial irrigation will compensate for a failure of the natural rain, and when this happens, the plants must be left for three or even four months longer, in which case the produce will be deficient both in quantity and quality. But in an ordinary season, the produce of a *podu* or plot containing an acre and three-quarters will yield from 5 to 10, averaging about 8, Candies of 500 lbs. each.

The plants are dug up with a light wooden spade tipped with iron, and are tied into bundles of a handful each, without cutting off the stalks. They are then left to dry, the leaves wither and fall off, and the bundles are weighed and removed. Before the digging begins, the seeds, which have now ripened, are shed, and being exceedingly minute, become inextricably mixed with the sand, the surface of which is therefore carefully scraped up, and reserved for future sowings.

The culture by means of artificial watering, is called *ărutadi podu*, but there is another system called *ivaka podu*, in which when the rains are plentiful, hand watering is dispensed with, and advantage being taken of a full (or 18 inch) fall of rain at the time of sowing, the plants are left to the chances of the season, care being only taken, to keep them free from weeds.

The cost of cultivating a plot or *podu* is as follows :

	Rs.	A.	P.
Ploughing	5	0	0
Manuring	5	0	0
Clearing, smoothing, &c.	2	0	0
Watering	6	0	0
(N. B. If the rains are seasonable this is proportionably diminished)			
Weeding	6	0	0
Digging at so much the candy, generally about	36		
	60	0	0
Add the land tax at 14 Rupees the acre	25	0	0
Total.	85	0	0

Assuming the produce to be 8 Candies and the average price 16 Rupees per Candy 8 + 16 = 128 Rs.—85 = 43 for the cultivator's profit, which cannot be considered large, compared with the constant care and attention, required to secure a good crop.

It should be added that the assessment on such land as yields chay root, has been greatly reduced, and now does not exceed 2½ to 3 Rupees.

The average price has been taken at 16 Rupees, which was the market rate in 1854/55 but when the demand is good it rises as high as 25 Rupees.

The following Statement shows the extent of land *cultivated* with chay plant, in the year 1855/56, in the Districts of Rajahmundry, Masulipatam, and Guntoor, with quantity and price of the article produced.

	Land Acres.	Produce in Candies.	Price at the average of 16 Rs. per Candy.
Rajahmundry...	1,600	3,600	57,600 Rs.
Masulipatam....	175	630	10,080
Guntoor........	678	1,525½	24,408
	2,453	5,755½	92,088

No returns are forthcoming, of the outturn from the spontaneous chay root. But as the right of collecting it is farmed out, and the sum bid for it in Masulipatam only amounted to Rs. 335, the quantity cannot be large. But in Guntoor the rent sells for Rs. 7,450. The same land can only be worked every third year for spontaneous produce.

Most part of the root is consumed on the spot. The only exports from Bunder occurred in 1854/5, and 1855/6 during which 84½ Candies were shipped to Madras, and 91½ to Ipurpalem ; it is also carried by land to Velapalem, both large weaving villages in Guntoor. On a previous occasion 22 Candies were exported to Tranquebar, but the greatest part is used up in the town of Bunder, for printing chintz and dyeing cotton cloths, and most of the produce in Rajahmundry, comes to the same place. Of late years the demand has greatly fallen off, both from the decay of trade at Masulipatam,

and from the introduction during the last few years of a new dye.

This is known by the name of *Cherinji* and is the bark of a root grown in the Dekhan. When used with a leaf called *jaji*, also imported from the hill country of Ganjam, a colour is produced which is considered nearly equal to the *chay*, whilst the process is far simpler and much less expensive. On the other hand the color is neither so fast, so bright, nor so enduring. A drop of spirit allowed to fall on *Cherinji*, dyed cloth, takes away the color at once, but has no effect on the chay dye. During the last five years these articles have nearly superseded the use of *chay*, but, as no specimens have been sent to the Exhibition, the Jury are unable to say what they are.*

The *Cherinji* usually sells for 20 Rs. the Candy, the *jaji* leaf from 30 to 45 Rs. and is all fit for use ; whereas the stalks and bark of the *chay* root, included in the weight at the time of sale, have to be rejected, thus reducing the quantity very considerable. Sometimes a little *chay* root is mixed with *Cherinji* to improve the color. The increasing demand for *Cherinji* among the Native dyers, has caused a serious diminution in the produce of *chay* root during the last five or six years. Thus in Masulipatam, the average produce, which had been 680 Candies for the five years from 1846/7 to 1850/1, fell to 425 for the next five years from 1851/2 to 1855/6, and if the new dye continues to supersede it in the same proportion, it seems likely that the chay will be driven out of the market altogether.

Not only are *Cherinji* and *jaji* much cheaper, but the simplicity of the method of dyeing with them, compared with the complicated and tedious method involved in the use of the chay root process, would alone tend to bring the latter into disuse.

This is exemplified by the detailed description of the *modus operandi*, which was furnished to the Jury by their associate Veerapermal Pillay and which is added as an appendix to the Report.

RUBIA MANJISTHA—MANJIT.

Does not appear to be a product of this Presidency.

A single specimen only, and that an indifferent one, of old dried root, is exhibited by Soobaroy Pillay from Pondicherry, of poor quality.

Exhib.	No.	Yempalum.
1163	30	Madura *Yempalum Kodi* (branch.)
1162	29	„ *Yempalum Paki* (bark.)

The origin or use of this substance is not known. The Dyers of this place do not recognize it as a dye. The Jury conjectured it might be obtained from *Tephrosia tinctoria*, the Telugu name of which is Yempal Chettu. But the *Tephrosia* is a herbaceous plant which could not produce so large a branch as No. 1163, nor is it probable that the article would be sent with a Telugu name from a southern District. Further references have been made to the Madura Local Committee for information on this point, without eliciting a reply.

The Native dyers seemed to think the roots must belong to the *papli cheka* or *sural patta*, which comes next under consideration.

PAPLI CHAKKA.

Under the vaious names of

1 *Pappili Chakka* or *Poppudi* పప్పిలి or పొప్పడిచక్క Madras, Bellary, Salem, Bangalore, Nellore.

2 *Soorool pattee or sural patti* సురుళపట్టే

3 *Suroogoodoo*, *Chooroogoodoo*, *Surugudu* సురుగుడు Rajahmundry, Masulipatam.

4 *Chembooram Semburam* செம்பூராம்பட்டை Chengleput, Bangalore.

5 *Coola maram*, Bangalore.

were exhibited numerous specimens of the bark of a root of an unknown plant, much used as an adjunct in dyeing with chay root. Papli has been assigned to a Rhamnaceous plant† *Ventilago Maderasapatana*, and from specimens of the leaf only which were obtained, it certainly bears a strong resemblance to that tree. But the name of the tree from which the Chembooran is said to be obtained (vide Dr. Kirkpatrick) viz. *Swietenia febrifuga* is an error, for both barks are undoubtedly the produce of the same tree.

The specimens were classed by the associates of the Jury as follows :

Sort. I. } *Surugudu chuka*, Rajahmundry, Gopal Achari Exhibitor ; Best.
8313 *Surugudu* „ Do.

These specimens are equal to the best obtained by the Dyers of Madras, which come generally from Calastri, Sesham pettah, Trincomalie, &c.

Sort. II. } 669 *Soorool* bark, Chingleput.
8548 *Papli chukay*, Madras.
5706 *Soorafy* bark, Nellore.

The Chingleput specimens were full large bundles, collected by the *Yanadis*, a rude tribe who live in the Jungles of the Nellore District, and subsist by collecting honey, wax, drugs, dyes, and other natural products. The two next were proba-

* This *Cherinji* may be the finer kinds of the *Morinda* Bark which is cultivated largely in Bengal, and to which the Native associates of the Jury applied that name. *Jaji* is the name sometimes given by the Telugus, to the *Jasminum grandiflorum*, but whether it is the leaf used in dyeing, the Jury cannot say. A good description of the mode of using the *Morinda* and its adjuncts in Upper India, will be found in the 4th Vol. of the Asiatic Researches. Can *jaji* be the same as the *dhauri* or *Grislea tomentosa* referred to there ?

† Since the above was written it has been clearly ascertained that the plant is *Ventilago Maderasapatana*.

bly obtained by the Exhibitors (Appavoo Pillay and the Local Committee) from the same source.

Sort.} 664 *Chemboorun* bark, Chingleput.
III.} 5342 Do. Do.

were also good and only slightly inferior to the former. They were exhibited by Ismail Khan and Armoogum Moodely. The remaining samples were all inferior. This bark is only employed as an adjunct in dyeing with chay-root, as already stated; when mixed with chay, it gives a fine chocolate colour, and if galls be added, a fine full black.

The next colouring substance in importance is the bark of the *Morinda.*

MORINDA BARK.

Maddi chaka in Bellary, Salem, Bangalore, Kurnool, Rajahmundry.

Noonah in Chingleput, Tanjore, Salem.

Munja nedei or *noonah,* Madura.

Nela maddi, Kurnool, large woody specimens.

Saya Sittoo. Pondicherry.

Acha, Commissariat Officers, Moulmein.

The native Jurors applied the name *serinji* or *cheringi* to the small twigs or roots of this plant.

Fair specimens were exhibited from several districts, the tree from which it is procured growing freely every where, and no particular care being required in gathering it. The best specimen was that exhibited by Mr. G. T. Beauchamp, from Combaconum, worth 52½ Rs. per candy. That from Kurnool would have been quite equal, but it was old and rotten.

Those from Tanjore and Salem No. 5185, were equal, and worth 45 Rs. the candy. The *Nila Maddi* from Kurnool, and that sent by Hurry Row from Tanjore, was the produce of large trees and of little value. Specimens of the root in powder from the Salem Local Committee, and from Sundara Moodely, were good, and were valued at 45 Rs. but it is never sold in that state. The Pegu specimens were large and inferior. Several specimens of chips from various places were also exhibited, but of no value. It is one of the commonest red dyes, the colour is dull, though more lasting than some of the brighter tints obtained from other substances.

The best dye is procured from the bark of the roots of trees, three years old.

SAPPAN.

Several specimens of Sappan wood were shewn under the names of

Buckum, in India.
Teinj-jet, Pegu.

A large quantity of the species of *Cæsalpinia* yielding this dye is grown in Malabar, and its cultivation might be greatly extended. The export of wood from Malabar in 1856-57 was 16,962 Cwt. 2 Qrs. equal in value to Rs. 50,061. A custom prevails in Malabar, which though not connected with dyes may be mentioned. On the birth of a female child, the Moplahs are in the habit of planting from 40 to 50 seeds of sappan, and the trees, which reach maturity in 10 to 12 years, are her dowry when she is married. This dye is much used in Pegu and according to Captain Benson sells freely for 12 Rs. the 100 Vis. Silks dyed with this wood [Teinj-jet] of a dark red colour, were transmitted by Dr. Brandis from Pegu.

RED SANDERSWOOD.

A single specimen of *red Sanderswood* procured from *Pterocarpus santalinus* was exhibited by Appavoo Pillay. It is said to afford a good red, with a mordant of Alum, but does not seem to be in much use.

TURMERIC.

The specimens were neither so numerous, nor so good, as those of the previous Exhibition. Very little was contributed by the Northern Circars, although it is exported largely from the hill Districts. Five specimens were exhibited by Chendoo Nair from Malabar, and from Pegu by Dr. Brandis; the best and finest sample was that contributed by the Rajah of Vizianagrum, but the tubers were small and broken. It was valued at 50 Rs. the Candy, but had the roots been large, it would have fetched as much as 70 Rs. the Candy. The sample was labelled 7 pice the seer as the local price, which would be 33 Rs. the Candy. A Pondicherry specimen, though inferior in colour, was yet, from the large size of the roots, estimated at 60 Rs. the Candy. The rest were inferior and were classed in order of merit, as follows:

Cochin.
Malabar.
Chingleput.
Trichinopoly.
Salem.
Hyderabad (boiled.)

These were the only specimens adapted for dyeing purposes. The rest were merely fit for eating. The two kinds are distinguished by a fresh fracture or cut of the tuber. If it exhibits a rich unctuous lustre, it will yield a good colour, but if it has a dry look, it is useless for that object. A curious substance was exhibited by the Kurnool Local Committee, under the name of *Poovady* consisting of Cakes of Turmeric powder obtained from Hyderabad, the price of which was stated to be 6 Tolas the Rupee.

SAFFLOWER.

The only examples of this dye that were shown under the general name *Kusamba* were from Bellary, Coimbatore, Kurnool, Bangalore, and Moulmein and a few purchased specimens from Madras. All the samples were small. That from Bellary was estimated to be worth 5 Rs. the maund here; local value 3 Rs. As already observed, it is used in conjunction with chay root, for dyeing various shades of pink and red, which are bright and delicate, but will not last. The mordants employed are lime juice and soda (Dhobie's earth).

ROTTLERA TINCTORIA.

Kapala, Salem, Kurnool, Mysore.
Vasanta Gunda, Northern Circars.

The best specimen was that from Lingamparti in the Rajahmundry District, which was worth 17 or 18 Rs. the maund, of 25 ℔s. Good samples were sent by the Rajah of Vizianagrum; (valued here at 12 Rs. but costing there only 5 Rs.) Mr. Wrightman, Apothecary Mysore Commissiou; and the Salem Local Committee. From the latter were also received specimens of silk treated with the dye, which produces a yellow colour. The best in the Madras market, comes from the Jivadi Hills between South Arcot and Salem. It is fixed by means of common Soda, and is very easy of application. It is not much used in Madras, but, as was observed in the Jury Report of 1855, it seems eminently deserving of more attention than it has hitherto met with.

BUTEA FRONDOSA.

The red flowers of this tree exhibited from Nellore and Bellary, under the name of *Palas* (Nos. 1417,1418) were submitted in small quantity. With Alum they give a yellow dye, which the addition of a little Soda turns to orange. It does not appear to be extensively used, nor probably could the article meet an extensive demand.

MEMCYLON TINCTORIUM.

The native names for the blue flowers of this tree, are *Alli*, *Cassa*, and *Vassa Casa*, the first being its Northern or Teloogoo, the two latter its Tamil designations. It comes from Nellore, Tanjore, Salem, and Pondicherry. The Salem is the best. The native dyers employ it as an adjunct to chay root, for bringing out the colour, in preference to Alum, which injures the thread. By itself it gives an evanescent yellow. It is very cheap, costing about one anna the marcal.

LAC.

The specimens were all scanty and generally poor. A box of well selected samples, received from Mr. Claud Hamilton Brown of Mirzapore, is deserving of commendation. Mr. Brown furnished also the following test for determining the quantity of the article.

Take,... 4 grains Dye.
6 do. Cream of Tartar.
13 do. *Woollen* cloth.
15 minims sol: of Tin.

put in an evaporating pan, with water, and boil over a spirit Lamp, till all the colouring matter is absorbed from the water. This you will readily ascertain, by putting a drop on your shirt sleeve. The test while boiling, should be occasionally stirred with a glass rod.

ARNOTTO.

The seeds of *Bixa orellana* are known by the Indian terms *Jaffarani* (Teloogoo) and *Vennei Virai* (Tamil) of Pondicherry. *Thee-din-see*-(Pegu).

Specimens were sent from Madura, Bangalore, Nellore, Tanjore, Pondicherry, and Pegu; all except that from Hurry Row of Taujore, was old and of inferior quality. It yields a colour of various shades of pale red and orange, which however cannot be fixed. It is employed extensively by washerman in the Northern Circars, for giving the reddish tinge to the *dhotis* or men's cloth, worn by all classes of the population. The orange coloured garments of Jangams, Fakirs, Byragis, and other religious mendicants are dyed with this substance.

CASSIA TORA.

The seeds uuder the names of *Tantepu*, and *Tagarapu*, are exported from the Northern Circars for dyeing blue with Indigo. Samples were transmitted by the Rajah of Vizianagrum, and by the Bellary Local Committee. The associates of the Jury could give no information of the process. The price was stated to be 4 annas the marcal.

CASSIA AURICULATA.

The yellow flowers of this Plant were exhibited under the name of *Avarai-pu*, as a dye, but the Jury could not learn that it was ever used, although it daubtless would yield a colouring matter.

MYROBALANS.

Various specimens of these seeds and galls the produce of various species of *Terminalia* were exhibited. They are too well known to call for further notice.

ACACIA RUGATA.

A cake of a pale green, indigo-looking substance, was sent by Dr. Brandis with the Pegu consignment, under the name of *Keen-boon thee*, and said to be prepared from the leaves, of *Acacia rugata*. Specimens of the fruit and leaves, are stated in Dr. Brandis' catalogue to have been also transmitted, but the Jury were unable to find them. No account of the use of the dye was given by the exhibitor.

COSCINIUM FENESTRATUM.

The root and dried leaves of this curious plant, were exhibited by Mr. Thwaites from Ceylon under

the Singalese name of *weni-welle* or "false Colombo root"; by Dr. Cleghorn from the Western Coast as "*Coscinium fenestratum*", and by the Cawaye Tahsildar as *Mara manjil*, or "tree turmeric." The Jury had no information of its dyeing properties, but as it contains a large proportion of *berberine*, it could without doubt be usefully employed, for producing a yellow colour, if procurable in sufficient quantity. But on this point nothing is known to the Jury.

POMEGRANATE FLOWERS.

Some pomegranate flowers were transmitted from Bellary as a dye, but the Jury could not learn that the article had ever been used, for producing a colour. It is deserving of enquiry however, whether the very rich and beautiful tint of this flower, has ever been extracted in the form of a dye, by any local process.

LICHEN.

Specimens of Lichen under the name of *Ratti-pu* ("Stone flower") were received from the Nellore Local Committee. The Jury requested Dr. A. J. Scott to favor them with his opinion of their value. He stated that it was difficult to extract the colouring properties of Lichens save by a long and tedious process. Subsequently they received from him the following report. "The Lichens examined by me "do not appear to possess any very well marked "dyeing properties. By the mode of testing how- "ever, employed by Westring of Stockholm, a yel- "lowish fluid has been obtained through the agency "of ammonia, and chloride of ammonium, which "imparts its colour to cloth immersed in it."

COCHINEAL.

Of this substance there was a single poor specimen from Bangalore. The Catalogue stated that another had been sent by Dr. Riddell from Bolarum, but it was not forthcoming.

GRISLEA TOMENTOSA.

The red flowers and the leaves of this plant, were exhibited from Rajahmundry, but nothing is known here of its colouring properties. In the Northern Circars, where it is known under the names of *Godari, and Reyya manu*, the leaves are employed in dyeing leather. Sheep skins, steeped in an infusion of the dried leaves, become a fine red, of which native slippers are made. The dried flowers are employed in Northern India, under the name of *Dhauri* in the process of dyeing with the Morinda bark, but not apparently so much for their colouring as for their astringent properties. (Asiatic Researches Vol. IV. page 28.) Dr. Gibson states that in Kandeish, the flowers form a considerable article of commerce inland, as a dye. (Graham's Catalogue.) It grows abundantly in the hilly Tracts of the Northern Circars.

MALAPOO.

Small dried flowers under this name, were transmitted by the Salem Local Committee. They have been ascertained to be the flowers of the *Cedrela toona* and are said to yield a yellow dye with alum, but the article is unknown here. It appears to be worthy of further attention.

The Jury desire to record here, their appreciation of the excellent collection of dyes, exhibited by the Chamber of Commerce, with their prices attached, which proved of the greatest service, by affording a standard of comparison for the similar products that came under their notice. The Jury also desire to bring to notice, an excellent and very neatly arranged assortment of dyes, exhibited by Native Surgeon Francis Appavoo Pillay, with their Botanical, and Vernacular names, and notes of their uses. This collection, the Jury consider to be deserving, of some mark of distinction. In conclusion they have to notice a sample of Gamboge submitted by Mr. G. Wrightman, Apothecary, Mysore Commission, who seems to have taken much pains in collecting and forwarding articles for exhibition. Gamboge, however, being more used as a pigment does not come directly under the Jury's cognisance. The same remark applies to the Prussian Blue exhibited by Rungasamy Moodely and Soobrayah Pillay of Pondicherry, a recently introduced manufacture, of which they engage to deliver 25,000 lbs. per annum, of a quality superior to the sample, at the rate of 3 francs per lb.

J. T. MACLAGAN.
Reporter, SubJury.

WALTER ELLIOT,
Chairman Class IV.
15*th March* 1858.

It is right to mention that the botanical, and vernacular nomenclature, as well as the general history of these dyes, was furnished by the President of the Jury, the Honorable Mr. Elliot, who has bestowed much labor in carefully digesting the information obtained from the native associates and others.

J. T. M.

APPENDIX.

Red.—Native process for dyeing red with Chay Root, calculated for 1 Viss, (or 3 and $\frac{1}{8}$ lbs.) of white Twist

Take of sweet oil....................	6 Pollums.
Ashes of the milk hedge...........	6 do.
Sheep's dung........................	3 do.

mix and keep in an earthen vessel for the space of 4 or 5 years, the older it is the better. Then when about to commence the process of dyeing, to the above mixture add

Fresh ashes of milk hedge ...	8 Measures.
Spring water......................	4 do.

mix and strain and add to the strained fluid, shake the whole well together and then add

Sweet oil..........................	15 Pollums.
Sheep's dung......................	15 do.
Spring water......................	1 Measure.

mix the whole in a vessel. Then steep the twist in

it for an hour, pressing and squeezing it well with the hands to cause it to absorb the fluid fully, after which leave it to soak. On the following day remove the twist and dry it in the sun. Then take in a vessel afresh

Ashes of milk hedge............ 6 Measures.
Spring water...................... 3 do.

mix and strain, and add to the strained fluid

Sweet oil.......................... 15 Pollums.

Shake the whole well together and steep the thread in it for an hour using the hands as before described, leave it to soak all night. Next morning take out the thread and dry it in the sun. In the evening of the same day take in a vessel afresh

Ashes of milk hedge................ 6 Measures
Spring water........................ 3 do.

mix and strain, to which water add

Sweet oil.......................... $7\frac{1}{2}$ Pollums

steep the thread in the mixture using the hands as before and leave till next morning. Then remove and dry in the sun. Next take afresh

Ashes of milk hedge............. 3 Measures
Sweet oil........................... $3\frac{3}{4}$ Pollums
Spring water........................ 3 Measures

mix and steep the thread using the hands as before and leave it soaking until next morning, when remove and dry in the sun take afresh

Ashes of milk hedge........... 3 Measures
Sweet oil.......................... $3\frac{3}{4}$ Pollums
Spring water...................... 3 Measures

mix and steep in as before until next morning, then take afresh

Ashes of milk hedge.......... $1\frac{1}{2}$ Measures
Sweet oil.......................... $1\frac{3}{4}$ Pollums
Spring water...................... $2\frac{1}{2}$ Measures

mix and follow the process as before, and take afresh

Ashes of milk hedge.......... 1 Measure
Sweet oil.......................... $\frac{15}{16}$ Pollums
Spring water...................... 2 Measures

mix and follow the process as before, then take afresh

Ashes of milk hedge.............. $\frac{1}{2}$ Measure
Sweet oil............................ $\frac{1}{2}$ Pollum
Spring water........................ 2 Measures

mix and follow the process as before, dry the thread for 3 *days* in the sun, on the *4th day* take afresh

Ashes of milk hedge........... 3 Measures
Sweet oil........................... $2\frac{1}{2}$ Pollums
Spring water...................... 3 Measures

mix and follow the proceess as before, but dry the thread in the *shade* the same night. Then take afresh before noon next day

Ashes of milk hedge.......... $1\frac{1}{2}$ Measures
Sweet oil.......................... $1\frac{1}{4}$ Pollums
Spring water...................... 2 Measures

mix and strain, then steep the thread in the strained fluid a whole day and night, remove the thread next day, and expose it in the sun for 4 days. Then leave the thread untouched for a whole month and after the expiration of that period, expose it for a day to the sun. On the day following wash the twist in pure spring or river water, and on the evening of the next day, take in a vessel afresh

Spring water......... 10 Measures } mix and add
Pounded Alli leaves. 4 do. }
Powder of Chay root $1\frac{1}{2}$ do.

mix the whole, steep the thread in the mixture using the hands as before, and leave to soak for the night. On the following morning, wash the thread in pure water and leave to dry.

The above process to be repeated afresh for the seven following evenings, omitting the Alli leaves after the first 2 days. On the 8th day in the morning allow the thread in the mixture to boil say from 4 to 8 P. M., then remove and keep the thread in the vessel *covered* until next morning, when remove the thread and wash it in pure water, leaving to dry in the shade for a whole day. Repeat the washing and drying for the 4 following days. On the fifth day take afresh

Ashes of milk hedge........... 3 Measures
Spring water....................... 3 do
Sheep's dung...................... 3 Pollums
Sweet oil............................ $2\frac{1}{2}$ do

mix, steep the thread, using the hands as before, and then take it out to dry. A similar course must be followed for the 3 succeeding days, then keep it quiet 1 day; on the following day wash the thread in good water, and leave to dry all next day. Then take afresh

Powder of Chay root......... 5 Pollums
Spring water...................... 10 Measures

mix, steep the thread, observing the same process as before; next morning remove the thread, and wash it in good water, and leave to dry following a similar course for 3 days; then keep the thread quiet for 10 days, after which take afresh

Ashes of milk hedge.......... 3 Measures
Sweet oil .... $2\frac{1}{2}$ Pollums
Spring water .... 3 Measures

mix, steep the thread, observing the same course as before and leaving it till next day, then dry it in the shade and follow the same process 3 days; then leave it for 10 days, after which wash in good water and take afresh

Powder of Chay root......... 5 Pollums
Spring water...................... 8 Measures

mix, steep the thread in the mixture, using the hands as before, and dry in the sun next morning, repeat the same the 3 following days, then on the succeeding morning wash the thread well in good water and when dry, it will have attained a beautiful fast red colour ready for weaving purposes.

CHOCOLATE.

Process for dyeing white mule twist of a chocolate colour, calculated for 1 Viss or 3 and $\frac{1}{8}$ lbs.

Take of sweet oil............... 6 Pollums
Ashes of milk hedge.......... 6 ,,
Sheep dung...................... 3 ,,

mix and keep in an earthen vessel for the space of 4 or 5 years, and after that lapse of time to the above mixture add

Ashes of milk hedge.......... 8 Measures
Spring water .... 4 „
mix and strain, and add to the strained fluid
Sweet oil................ 15 Pollums, when well shaken, add
Sheep dung........... 15 „
Spring water.......... 1 Measure
mix in a vessel and steep the twist in it for an hour, pressing and squeezing it with the hands to make it absorb the fluid fully. Leave it to soak. On the following day remove the twist and dry it in the sun. Then take in a vessel afresh

Ashes of milk hedge......... 6 Measures
Spring water.................. 3 „
mix and strain, then add to the strained fluid
Sweet oil......................... 15 Pollums
when properly shaken, steep the thread in it for an hour using the hands as before described, and then leave it to soak; remove it next morning and dry the thread in the sun. The same evening put in a vessel afresh

Ashes of milk hedge......... 6 Measures
Spring water.................. 3 „
mix and strain. Add to the water
Sweet oil........................ $7\frac{1}{2}$ Pollums
steep the thread in the mixture using the hands as before, and leave it to soak, remove it next morning and dry it in the sun. Then take afresh

Ashes of milk hedge.......... 3 Mcasures
Sweet oil......................... $3\frac{3}{4}$ Pollums
Spring water...................... 3 Measures
mix and steep the thread using the hands as before, and leave it soaking until next morning, when remove and dry in the sun. Take afresh

Ashes of milk hedge.......... 3 Measures
Sweet oil.......................... $3\frac{3}{4}$ Pollums
Spring water.................... 3 Measures
mix and steep as before until next morning, then take afresh
Ashes of milk hedge......... $1\frac{1}{2}$ Measures
Sweet oil......................... $1\frac{3}{4}$ Pollums
Spring water.................... $2\frac{1}{2}$ Measures
mix and folllow the process as before, and take afresh
Ashes of milk hedge......... 1 Measure
Sweet oil......................... $\frac{15}{16}$ Pollums
Spring water.................... 2 Measures
mix and follow the process as before, then take afresh
Ashes of milk hedge......... $\frac{1}{2}$ Measure
Sweet oil......................... $\frac{1}{2}$ Pollums
Spring water.................... 2 Measures
mix and follow the process as before, dry the thread 3 *days* in the sun, on the *4th day* take afresh

Ashes of milk hedge......... 3 Measures
Sweet oil......................... $2\frac{1}{2}$ Pollums
Spring water.................... 3 Measures
mix and follow the process as before, but dry the thread in the *shade* the same night. Then take afresh before noon next day

Ashes of milk hedge........ $1\frac{1}{2}$ Measures
Sweet oil................... $1\frac{1}{4}$ Pollums
Spring water............... 2 Measures
mix and strain, then steep the thread in the strained fluid a whole day and night, remove the thread next day, and expose it every day in the sun for 4 days, then leave the thread alone for a whole month and the day after its close, expose it to the sun. On the following day wash the twist in pure spring or river water, and on the evening of the next day take in a vessel afresh

Powder of chay root ..... $\frac{1}{4}$ Measure
Bruised bark of soorala.... $\frac{1}{4}$ „
Spring water............. 10 „
mix, steep the thread in the liquid, using the hand as before, leave it to soak all night and next morning dry it in the sun. The same process to be followed for 5 days, using fresh mixture each time, and on the 6th day in the evening, let the thread remain in the vessel with the mixture, and boil it for 4 hours. On the following morning wash the thread in pure spring water, and after drying it in the sun, it is ready for weaving purposes.

GREEN.

Process for colouring white Mule Twist in Green calculated for 1 Viss or $3\frac{1}{8}$lbs.

Take of Indigo... ... ... 2 Pollums
Thuggahra seed 4 „
Chunam ... ... 2 „
Spring water ... 12 Measures.
mix, steep the thread in for 3 hours, using the hands for squeezing the thread in the mixture, that the infusion may be properly received, then dry in the sun, after which preserve it quiet for 5 days. On the 6th day following take

Fine saffron powder... 1 Viss
Spring water ... ... 5 Measures
mix, steep the thread in the mixture, using the hands as before described, and leave it to soak the whole night, take afresh

Acid Congy water ... ... 1 Measure
Spring water ... ... 5 Measures
mix, and wash in it the thread, and dry in the shade, when it will be ready for using.

YELLOW.

Process for colouring white Twist into yellow, calculated for 1 Viss or $3\frac{1}{8}$lbs.
Wash the thread first in good water, then take
Fine Saffron powder ... ... 1 Viss
Spring water ... ... 8 Measures
mix, steep the thread, using the hands as before described, and after soaking for 6 hours, take afresh
Acid Congy water ... ... $\frac{1}{2}$ Measure
Spring water ... ... 4 Measures
mix, and wash the thread in it, remove and dry in the shade when it will be ready for weaving purposes.

SECTION IV.

REPORT ON TANNING MATERIALS.

Sub-Jury.

The Hon'ble Walter Elliot, Esq.—*Chairman.*

J. Rohde, Esq.—*Reporter.*

In tanning substances the Committee did not observe anything particularly deserving attention, nor was the collection by any means a complete one, the properties of the pods of the Cæsalpinia coriaria (*divi divi*) and of the barks of the Cassia auriculata, Cassia fistula, Acacia arabica and others of the same family, are already well known and have been particularly dwelt on in the Guntoor Local Committee's Report in transmitting articles for the Exhibition of 1855. The bark of the Zizyphus is not in use in the parts of the country with which the Committee are acquainted, but it is well known. Catechu is well known as a tanning substance in England, and was tried by the Guntoor Committee already referred to, the country gall-nuts and the gall, (*machikay*) mentioned and reported on by that Committee. The Pomegranate fruit, the bark of the stems and roots, are already well known and from the limited supply could never become of importance for tanning. The Theeka bark the Jury do not know it is imported, and the local designation only is given. The Panictry fruit is not otherwise described nor are the Jury aware of its preculiar properties.

SECTION V.

VEGETABLE SUBSTANCES, FIBRES.

Sub-Jury.

Colonel Reid.—*Reporter.*
J. D. Sim, Esq.
J. Breeks, Esq.
Captain Hawkes.

Associate.

Dr. Hunter.

1. *Coir Fibre, Cocos Nucifera.* There were many samples exhibited. Of these No. 4,643 sent by Hurry Row, Tanjore, was unquestionably the best, possessing a cleanness and color, combined with strength, not to be met with amongst the others.

The Committee however noticed with approbation two other samples, namely those of E. Ahobal Row No. 1,737 and a sample from Rajahmundry No. From Chungleput also a creditable sample was exhibited No. 5,343. But on the whole the specimens of Coir, so long an article of general use and commerce, did not by any means come up to what might have been expected.

A specimen of Cocoa Fibre from Coimbatore, apparently from the leaf.

No. 2,969 was exhibited by E. B. Thomas, Esq. This was clean, carefully prepared and well suited for fine Basket work.

2. *Date leaf, Phœnix dactylifera.* Of this, two specimens alone, need be mentioned, the best and cleanest, No. 643, and a carefully prepared specimen by E. Ahobala Row No. 1,741.

The remaining samples were submitted in a very raw state, carrying no pretension whatever to merit.

3. *Palmyra leaf, Borassus flabelliformis.* Here again but two specimens were deserving of notice.

No. 4,081, a clean sample from J. J. Cotton, Esq., of Masulipatam and

No. 753, of great length but coarse, from Paupyreddy of Chingleput.

The Committee remark that in Fibre prepared from Trees of the Palm tribe, almost every merit will depend on the preparation of the article after gathering. It can hardly be expected that excellence can be obtained by any peculiar mode of cultivation. In the manipulation therefore, any degree of improvement must be looked for.

4. *Aloe Fibre, Agave americana.* This Fibre is capable of being turned to great account and several very fair samples were exhibited.

The cleanest and best prepared were those of Hurry Row, No. 4,621, and No. 2,977, from J. B. Roupell, Esq., these were soft, pliant and of good strength. E. Ahobalarow exhibited a fair specimen. Kanagaroyen, Native Surgeon at Coimbatore, exhibited Aloe Fibres, dyed of good colors. These are interesting specimens, and though not coming under this section of the Jury, the Committee could not but remark some very serviceable door-mats manufactured in patterns from these colored fibres. Good clean Fibre of Aloe was exhibited by W. Elliot, Esq. of Cuddapah. On the whole the Fibre of the Agave shewed well and both Hurry Row and Ahobala Row are entitled to prizes.

5. *Marool or Munjee Nar, Sanseviera zeylanica.* Here also Hurry Row Exhibited the best specimen, No. 4,613. Those from Kurnool in larger quantities were good samples and deserve notice. The Marool or Sanseviera is a plant that has not long attracted notice but is unquestionably deserving attention. In some parts of India very large quantities are found, growing wild. On the Pulicat Hills it is to be met with in some abundance, and in the Kurnool District it is most plentiful. It is of the same natural order as the aloe (not agave) Hemerocallidœ, aud capable of cultivation. From its strength and the softness of its fibre, it might be brought more into use, and become a valuable product, possessing as it does the property of resisting the usual effects of damp.

6. *Fourcroya gigantea of the Aloe tribe.* This plant, although common iu some of the large stations, is not met with elsewhere. It yields a very long and strong fibre and deserves more attention

than is given to it. The samples shewn were indifferent, and inferior to those exhibited in 1855.

7. *Screw Pine—Pandanus odoratissimus* ; *Thaulay Nar*. There was one clean sample of this, No. 55, from Chingleput—Appow Moodely of Pondicherry also exhibits Bundles of this Bark, No. 7159, carefully put up for exportation. There is not much strength in this Fibre, it could be used only for mat making or paper.

8. *Plantain Fibre, Musa paradisiaca.* Hurry Row exhibited a clean silky looking bundle of this, No. 4607 : other samples fair.

9. *Yercum, Calotropis gigantea.* This Fibre is strong and soft, and capable of being turned to much account. The whole plant from which it is taken, is of value. Preparations of it enter largely into the Native Pharmacopœa. Good charcoal for Gunpowder is made from it and the seed vessel produces a silky kind of cotton exhibited also, and made into cloth.

Kistnah Row of Tanjore exhibited a good sample of the Fibre. E. Ahobala Row had also a fair sample No. 1,729.

10. *Junapum, Crotalaria juncea.* This is a most valuable Fibre and is indeed the hemp of India, "*Sunn.*" Most kinds of Cordage, as well as the sack cloth known as "Gunny," are manufactured from it. It is capable of improvement both in cultivation and preparation.

Messrs. Fischer and Co. of Salem exhibited the best and largest sample, No. 6,857, entitling them to a reward. Good Bundles were shewn Rs. 3891, 2, 3, 4, by various exhibitors from Rajahmundry and a small clean sample of good quality by Mr. Silver of Tinnevelly.

11. *Bendee, Hibiscus esculentus.* The best shewn was No. 3850 from Rajahmundry, long in staple, soft and pliant. A sample, No, 5346, of the Hibiscus cannabinus from Chingleput was fair. The former plant produces the common esculent of our tables, Bandykai. Both are of the Malvaceous tribe, the bark of most of which abounds in flaxen fibres.

12. *Flax, Linum usitatissimum.* This plant has been cultivated in the Northern parts of India, principally for the oil contained in the seeds.

To the preparation of the Fibre much attention is paid in Europe. Mr. Underwood produced some fair samples of English flax, plain, carded and hackled : they were dark in color like the tow of England. The *best sample* No. 1, though indifferently prepared, was of good length and was from the Hyderabad Country.

13. *Pine Apple, Ananassa sativa.* The Fibre from the Pine Apple is woven into the finest fabrics, particularly in Manilla, No. 7,037, from Padre Probhu ; from Mangalore was a very good specimen.

14. *The Hill Nettle, Urtica pulcherrima.* Nos. 2460 and 2462 were very fair samples of this fibre exhibited by the Salem Local Committee.

The plant from which this fibre is taken is deserving notice. It yields the latter long in staple and of considerable strength. On the Neilgherry Hills it is known and appreciated by both Todawers and Berghers.

15. *Paritium macrophyllum.* Captain Benson exhibited fibres of Paritium macrophyllum, Nos. 8720 and Urena lobata (both malvaceous plants) from Moulmein. These samples possess much merit and the former especially so, being long, soft, pliant and strong, color brown.

16. *Arena lobata.*

17. *Vernonia anthelmintica.* Amongst new fibres appears a sample of Vernonia anthelmintica No. 6,614 : it is rather hard ; but this may possibly be the result of bad cleaning.

Barks of Trees. There was a large and varied collection of Barks, but in so unprepared and crude a state that their properties cannot be determined by their appearance. This is the more to be regretted, as doubtless many of these fibres might be improved and rendered soft and pliant by the usually adopted means whilst fresh. Several of them can be spun and woven into cloth. Among the most promising of these barks are those of varieties of Bauhinia, Ficus, Acacia, Azadarachta, Cordea and Butea.

Good samples were exhibited of Bags from Wynaud and Mangalore formed from the Bark of Trees taken off bodily. The best of these are from Lipurandra saccidora, or Antiaris saccidora.

These are curious specimens of how little Nature owes to Art, in producing one of the most useful articles of domestic economy.

Mr. Jaffrey exhibited 45 small samples of fibres, from Plants in the Horticultural Garden, neatly arranged, and most of them well prepared (without maceration) though not sufficiently cleaned to shew the qualities of each fibre.

The commonly known fibres such as those of the malvaceous tribe, "Musa," "Agave," "Asclepias" are surpassed by others exhibited. The Fourcroya is the longest and best specimen (though small) exhibited of its kind. Amongst the samples are several basts well worthy of notice, both from variety, as well as length and strength of fibre. The best of these are from "Cordea obliqua," "Eleodendron anfractuosum," "Abutilon judaicium," "Sterculea alata," "Adansonia digitata."

This is an interesting collection but its value is much lessened by the samples being so small.

The Honorable W. Elliot sent 2 Fruits of Luffa ægyptiaca, grown in his garden, from seed brought by him from Egypt. This is one of the Curcurbitaceæ. The Genus "Luffa" owes its name to the Arabic word for Luffa Ægyptiaca, viz. "louffor" "Loof," it is a remarkable kind of Gourd. When quite ripe, within, it has no pulp, but is dry and filled

with netted fibres, very much interwoven. It is used in Turkish baths as a scrubber. It is a useful product, and if cultivated would probably find ready sale.

Mr. Elliot has kindly offered to supply seeds to Native Gardeners, or others who will apply to him for them. It is of easy culture, trained on a raised Mundwa, similar to the Snake Gourd &c.

COTTONS.

A very extensive and varied display of Cottons was exhibited.

FOREIGN COTTONS.

1. *Bourbon.* The best sample of Bourbon Cotton is one, No. 5744, of the prize products from the recent Tinnevelly Local Exhibition, of a very superior quality, soft, long in staple and strong. The sample is a small one.

2 *and* 3. *Bourbon.* Messrs. Fischer and Co. have two good samples of Bourbon Cotton, No. 6817, and 6818. The latter a fine Bale, well cleaned. and soft, but rather short in the staple.

4. *Sea Island.* A good sample of Sea Island Cotton from Hyderabad well cleaned and long in staple.

5. *American.* No. 10 American Cotton from Pondicherry, good, strong and clean, but short in staple.

6. *American.* A specimen of American Cotton from Adony, indifferent.

Colored or Nanking. There were several samples of the coloured or Nanking Cottons.

7 *and* 8. The best was that exhibited by Messrs. Fischer and Co. No. 6850, from Salem. That from Tinnevelly was good.

9 *and* 10. The Samples from Guntoor and Cuddapah indifferent.

Country, Indigenous. A great variety exhibited, some from almost every district; many of these however were scarcely worth looking at, being uncleaned and not got up in a manner that could possibly attract attention in the market. This is a point which deserves remarking on. Sufficient attention does not appear to be given, in many instances, to the quality of the article exhibited. The idea appears to obtain, that it is sufficient to exhibit the *article* without any reference to its quality, Throughout this section samples are met with rather indicating the wretchedness of the produce than to what perfection it may be brought. No. 5,739, and No, 3,962, the former from Guntoor and the latter from Masulipatam, fine, long in staple and soft.

3. A sample of cotton which obtained a prize at the Hyderabad Local Exhibition was shewn by Mr. Bijent. It is of fair length, well cleaned and fine.

4. A good sample exhibited by Captain Balmain from Raichore.

5. From Bellary there were four samples, all short in staple, badly cleaned and of indifferent quality.

6. From Nellore the samples were indifferent, with one exception, which, though of a bad color, was long and strong in staple.

7. Guntoor Cotton very carelessly collected, and of indifferent quality.

8. Ladum Cottons exhibited from three quarters, Nos. 4090, from Mooganoor and 4,544, from Tanjore, though indifferent in feel and appearance, are strong.

9. Nadum Cotton from Madras, an indifferent sample, though clean.

10. *Silk Cottons.* From Bombax, Calotropis. Cryptostegiæ &c. exhibited from several districts, These are not marketable, though silky, and can be worked up with the real Cottons, Nos. 3898. Something similar to the above from a Grass apparently; native name Jummoodoody, only fit for paper-making.

F. A. REID,

Reporter.

P. S. In the 1st Volume of the second series of the Indian Journal of Art, will be found the commencement of a most carefully written and useful paper, entitled " Suggestions for cleaning fibrous plants for cordage and weaving" by Dr. Hunter. The Committee notice this, in reference to their remarks on the little prepartion which specimens of fibres frequently receive, at the hands of Exhibitors, in the hope that the usefulness of these suggestions and the evident inexpensiveness of their adoption may lead future exhibitors to avail themselves of their aid.

F. A. REID,

Reporter.

SECTION VI.

TIMBER AND ORNAMENTAL WOODS.

Sub-Jury,

The Honorable W. Elliot Esq. *Chairman.*
Lieutenant Colonel Pears, C. B. *Reporter.*
Mr. W. B. Wright.
Mr, Williams.
Major Maitland.

Associates.

Lieutenant Hawkes.
Lieutenant Beddome.

The observations contained in the Report of the Sub Jury in this Department in 1855 have not been without their effect on the present exhibition.

The general collection of woods exhibited is remarkably interesting, and the contributions from some of the Districts very complete.

The most important contributions are from

Malabar,	Bangalore,
Palghaut,	Hyderabad,
Coimbatore,	and
Madura,	Pondicherry.

There are also smaller collections from Ootacamond, Bellary (Ramanmullay) from Burmah, through the Madras Local Committee, and from Masulipatam.

Malabar.—The Collection of specimens from Malabar, exhibited by the Collector of that District, merits especial notice for the care with which the specimens have been prepared and for the extent and importance of the contribution. It consists of specimens of 60 varieties of timber, 2 samples of each kind, the one being a piece of about 2½ feet in length with a section of 3 inches square, as suggested by the jury of the last exhibition, the other being a complete slab 4 or 5 inches thick cut across the trunk and including the bark. By far the greater part of this collection was represented in the Exhibition of 1855, and the woods then described seem not to require notice here. The following woods of which specimens are found in this collection appear, however, to be worthy of attention.

1st. The Ven (or ben) teak "Lagerstræmia microcarpa." This wood is abundant in the District of Malabar. It is not generally considered durable when exposed to the vicissitudes of temperature and climate. It has, however, been used to a considerable extent of late in ship building at Cochin and on the Railway. Malabar 2701 2755, Mr. McIvor 8276, Palghaut 276.

2nd. Poovoo. "Schleichera trijuga." This wood is described by Wight, List of timber trees (80) as a strong hard red wood, generally rather small, used to make pestles, spokes for bandy wheels, and such purposes, where much strength in small space is required. Palghaut 372, Malabar 2718.

The next wood in this collection deserving especial notice is the Agella, supposed by some to be the Indian Cedar wood, "Aquilaria agallocha." This is a light colored wood with a fine even grain, appears admirably adapted for furniture and many domestic purposes. It is said to be abundant in Malabar and has been already used for a variety of purposes by the Railway Engineers. The jury would recommend some further enquiry regarding this tree, the extent to which it is found in Malabar, and whether known in other parts of the country. Madura 1247, Malabar 2737, Mysore 2254.

The next wood to be noticed in this collection as not having been represented in the last exhibition is the "Vitex altissima," named by the exhibitor, "Magelloo," Tamil "Kat miella." It is thus described by Dr. Wight: "This is a large tree "frequent on the lower slopes of the ghaut mountains, but I am not acquainted with the timber, "except in so far as can be learned from a small "outside specimen, which seems close grained. It "is reported fit for Cabinet purposes." It would be desirable to learn more of this tree. A specimen formerly grew in Dr. Anderson's garden near the College bridge in Madras. Roxburgh describes the wood of one of its congeners Vitex arborea, common in the Northern Circars, as of a chocolate color, when old exceedingly hard and durable. Palghaut 281, Malabar 2751.

The last specimen to be noticed is the "Eugenia caryophyllifolium," by the Collector "Nawal." This wood is stated by Wight to be the Calypthranthes caryophyllifolia" of Ainslie, who speaks of it as a large tree with spreading branches. It is a very common tree, growing in all parts of the country, well known in these parts by its Tamil name "Nagamarum," and by Mahomedans as the "Jamoon tree," the fruit of which, a kind of blue plum, is sold in every bazar.—Roxburgh says the wood is hard, close-grained and durable, and of course is used for a variety of purposes. The wood appears, from the specimen before the jury, to be a close-grained, strong wood, probably useful for building and other common purposes.

The Jury cannot better conclude their brief notice of the Malabar collection, than by appending a valuable Memo upon eight different woods of that District drawn up by Mr. Sinclair, Superintendent of Carriage and Wagon Building under the Railway Company, which has been obligingly placed at their disposal by Mr. Wright, the Locomotive Superintendent of the Madras Railway.

"I have examined 13 different kinds of timber "which are easily procurable at Beypoor. I have "however only selected eight kinds of the best description of which I recommend purchases to be "made in the proportion of one thousand Candies: "thus,

Sample.	Tam.	Botanical.	Candy		Rs.	A.	P.
" No. 1	Caramardoo	Terminalia glabra	100	Price about	4	0	0
" No. 2	Erroll	....	200	"	4	0	0
" No. 3	White Cedar	?	200	"	4	0	0
" No. 4	Augillay	... . ?	150	"	6	0	0
" No. 5	Red Cedar	(Sethia Indica?)	50	"	3	8	0
" No. 6	Pillaymurdah	Terminalia chebula	50	"	3	0	0
" No. 7	Vellomardoo	Terminalia alata	50	"	0	0	0
" No. 8	Benteak.	Lagerstræmia microcarpa	200	"	3	0	0

"Sample No. 1, Caramardoo per Candy, Rs. 4

"This wood grows large, generally sound and "plentiful, is very suitable for strong framings, and "very durable in works. It is however, rather "coarse in its fibre, curly grained and difficult of "planing, or dressing off clean for painting or varnishing. In seasoning it also appears to open in "grain and shows like unto weather shakes of a "small kind. In consequence of this propensity. "the shrinkage appears very small per foot of surface. Its density lbs 5, oz 12 per superficial foot. "It is procurable in 25 to 30 feet length, and about "15 inches diameter, middle girth, will season in

"12 to 15 months in planks, and is not touched by "white ants.

"No. 2. Erroll, price Rupees 4 per Candy. This "wood grows similar in all respects to No. 1. It "is however more straight grained and more easily "planed, or cleaned off for paintings. Its shrink- "ing properties in seasoning is about $\frac{1}{8}$ per foot of "surface, its density lbs 5 oz 10 per foot superficial. "It is procurable in 25 or 30 feet length, and about "15 inches diameter at middle of log; will season "in cutting into planks in 12 months; and is very "lasting in worth either under ground or above "ground; will take paint or varnish very well, and "is not affected by white ants.

"No. 3. White Cedar, price Rupees 4 per Candy; "grows plentifully and large but not generally sound "in heart, if exceeding 24 inches in diameter at "middle of 35 or 40 feet log. This is a very use- "ful wood for general purposes, and in consequence "of its larger size converts economically into scant- "ling of all sizes. It is easily planed and worked; "its shrinking properties are very great in season- "ing, being about $\frac{1}{2}$ in 12 inches, its density is lbs 4 "per foot superficial, is durable above ground and "very lasting if kept free from moisture.

"No. 4. Augillay, Rupees 6 per Candy. This "wood grows similar in size to the Erroll (No. 2). "It is rather curly and cross grained in its fibre, "and is also difficult of planing clean for painting "on account of the grain rising on the surface after "being cleaned off, its shrinking properties are $\frac{1}{4}$ "inch per foot; its density is $3\frac{1}{4}$ lbs per foot su- "perficial; It is a bright colored wood; and would "look very well varnished; it is also of a tough "nature, though not so heavy per foot cube as the "others.

"No. 5. Red Cedar wood, Rupees 3.8.0 per Candy. "This wood grows large, is of a middling quality "easily planed and worked, seasons with a shrinking "of $\frac{3}{8}$ per foot superficial, it also keeps close and "sound; its density is lbs 2 oz $\frac{3}{4}$ per foot superfici- "al; it is straight grained and very useful in many "kinds of work. Its supply is however rather li- "mited.

"No. 6. Pillumardoo, Rupees 3 per Candy.

"This wood is similar in all respects to the sample "No. 1 Caramardoo, except color, which is yello- "wish brown, its density $4\frac{1}{2}$ per foot, and plentiful "in supply.

"No. 7. Vellamardoo, per Candy."

"This wood is similar to No. 6, but of a whiter "color, its shrinking properties are $\frac{3}{8}$ foot superfi- "cial, its density is $4\frac{1}{4}$ lbs. per foot.

"No. 8. Benteak, Rupees 3 per Candy."

"This wood grows of a good size and straight "grained, is of a good lasting quality above ground, "if kept free from moisture, it is easily planed and "worked, its density is lbs 4 oz. 8 per foot super- "ficial, its shrinking properties are $\frac{1}{4}$ inch per foot; "it is rather strong in nature and will cast in sea- "soning if not properly stored. It is useful for "heaving framings and such like works.

"*Note.*—The sample logs I have received are "*water wet** some and others had not been long "felled; the density, therefore, I have given must "only be considered as approximating to the vari- "ous differences in the woods when dry and season- "ed, and not as their actual weight when such is "the case."

MADURA.

The next contribution in this department to be noticed is that from Madura exhibited by Mr. Parker the Collector. It consists of 32 specimens of various forms and dimensions. The collection is interesting but contains few woods not already known and not reported on, on the occasion of the former exhibition. Among the woods not then exhibited the Jury observe in the present collection the following :—

"Puneecoy" wood "Guettarda speciosa." Madura 1259, Mysore 4255. This is a large sized handsome tree commonly seen in gardens, but not supposed to abound in the forests. The specimen is small but exhibits a closeness of grain and other characteristics rendering it deserving of further enquiry.

"Maghadum marum," "Mimusops elengi." Pondicherry 160, Madura. This wood is said to be employed in Cabinet making, and appears from the specimens here presented to be well suited to that purpose being light with a tolerably close and even grain. Dr. Wight speaks of it as being so much a cultivated plant that probably it is not much used and is therefore little known: this merits further enquiry.

Devadarum; Semboolinga, "Sethia indica." Madura, 1267, Bangalore, 4253, Hyderabad. This wood is described and mentioned by Wight who considers it identical with the "Erythroxylon areolatum" of Ainslie†. Ainslie (pp. 187, 213‡) was informed that a kind of wood oil was obtained from this tree in the Tinnevelly District. He adds that the wood is small, of a reddish brown color and very fragrant, so that the people of Mysore use it instead of Sandalwood.

The rest of the woods found in the Madura Collection are generally known and were noticed in the Jury's report at the Exhibition of 1855.

PALGHAUT.

The collection from Palghaut is exhibited by Kristnia Chettyar.

The specimens, 102 in number, are very small, but have been arranged with great care, the native and botanical names being given with each speci-

* i. e. Seasoned by steeping in water.
† Ainslie 2421, 8vo. ED. Cedar.
‡ Ditto 4to. ED.

men. The Jury notice in this collection the "Conocarpus latifolia" which will be subsequently referred to among the Coimbatore collection. They observe also a specimen of the "Dichrostachys cinerea," Tamil, Vadatata marum ; Tel. Velloor Chetta. This is described by Wight, List No. 105, as a small tree or rather large shrub; wood very hard and strong, but too small for any except common purposes.

COIMBATORE.

The collection from Coimbatore, Kistniah, Maramut Superintendent, Exhibitor, consists of 34 specimen pieces, about 13 inches long, with a cross section of 3 inches square, great pains appear to have been taken in the preparation of these specimens, and in the determination of their proper names.

Almost all the trees best known and most highly valued in this part of India are represented in this collection. Among those, however, which appear deserving notice here are,

"Briedelia spinosa," Mooloo Vengay. Coimbatore, 3010. This is described by Wight as a wood not known, though the tree is not uncommon, and attains a considerable size among the Alpine jungles.

The "Conocarpus latifolia" (Vellaynaga, Tamil). Coimbatore, 3029, Palghaut, 374. The wood according to this specimen is heavy, light-colored and close grained. The tree is described by Wight as tall and handsome, furnishing an excellent and very strong timber. The ashes of this tree are said to be in demand, as an article of food, among certain wild tribes, inhabitants of the forests about the Neilgherry Hills. The demand for it has been attributed to the large proportion of pure carbonate of Potash which it yields,—the diet of the same people including a large quantity of tamarinds. A handsome specimen is to be seen near the gate in front of the house known as Mooneapillay's Garden at Sydapet, now occupied by Mr. Shubrick. It is found abundantly in the Northern Circars, where Roxburgh describes it as universally esteemed for every economical purpose; towards the centre it is of a chocolate color and is then exceedingly durable. For house and ship building the Natives reckon it superior to every other sort, except "Pentaptera tomentosa" and teak.* Vol. II. pp. 444—merits further enquiry.

The "Nerium antidysentericum," Veppalei marum. Coimbatore, 3036, Palghaut, Madura 1244, Mysore. This wood is said by Wight to be excellent for cabinet-making purposes. It is found also to answer for wood engraving.

Ainslie, after describing the medicinal properties of its bark, speaks of the timber as chiefly prized in Cochin China for its beautiful white wood, which is of a fine grain and fit for making furniture. The specimen before the Jury seems to be taken from a young tree, and does not therefore well represent the timber.

PONDICHERRY.

The Jury have now to notice a very full and carefully prepared collection of specimens of wood from Pondicherry. These are all small pieces well adapted to exhibiting the grain color and specific gravity of the several woods, but not furnishing pieces of sufficient dimensions for experiments on their strength.

The Exhibitor Monsr. H. de Querret, sous Engineer, has greatly enhanced the value of his collection by a brief account of each tree, the purposes to which it is applied, its medicinal properties, if any, its local, as well as its botanical, name. It is remarkable that this interesting collection of woods in which many of the finest and most valuable trees of Southern India are represented is made entirely within the settlement of Pondicherry.

The "Eugenia racemosa" is a tree represented in this collection only, and was not produced in the former exhibition. It is described as a wild tree and as attaining to a large size. This tree is noticed by Ainslie, who gives an account of its medicinal properties. See Ainslie, Vol. II. page 56.

A small specimen of the well known "Strychnos nux-vomica" is found in this collection. The jury learn on good authority that white ants will not touch this wood, which is characterized with a remarkably bitter taste. Is used extensively in building in the Northern Circars, is found to grow to a large size in hill Districts, though commonly small and stunted on the plains.

"Dalbergia sissoo." A deep purple, rather heavy wood. The specimen exhibited under this name appears to be the true Dalbergia latifolia or Rosewood. It is stated on the authority of Major Lawford that the true Sissoo, Dalbergia sisso, is found in great abundance in Wynaad. The wood used under this name in the Bombay Gun Carriage Manufactory is supplied by the Forests on the Western Coast. The subject deserves further enquiry.

OOTACAMUND.

Mr. McIvor, Superintendent of the Botanical Gardens of Ootacamund, has exhibited a small collection consisting of 28 specimens. The collection consists for the most part of woods generally known as being of value and importance. The jury observe the following as being especially deserving of notice ; Sarcococca trinerva, or Neilgherry box wood, reputed to be very common on the Hills. Wood hard and durable, might be used in the Arts as a substitute for the real box.

"Dodonea viscosa," common on the Neilgherries, wood elastic and useful for tool handles.

* Flora Indica.

"Sapota elengoides," a large tree, common on the Neilgherries, wood strong and elastic, and like the hawthorn burns well when green.

"Grewia tiliæfolia." This wood is well known in central India, and much used in public works and also in the Jubbulpoor factory. Dr. Wight speaks upon report disparagingly of this wood, but it is valued in some parts of the country as a strong and durable timber and one that grows to a large size.

"Artocarpus echinata" is represented by Mr. McIvor as a large tree, yielding a good wood, though apparently not much used. Little appears to be known of this wood which deserves further enquiry.

"Padree marum," Stereospermum (sp.) There appear to be three useful species of this genus, viz. Stereospermum chelonoides is of a reddish color, said by Wight (List No. 110) to be the strongest of the two noticed by him.

"Stereospermum suaveolens" is described by him as a considerable tree, frequent on the Walliar jungles, wood strong and elastic, said to be fitted for making bows. List No. 63.

The 3rd species has recently been discovered in the valley of the Godavery and is of smaller size than the preceding, but appears to possess useful properties.

COCHIN.

Collection from Cochin. This collection consists of specimens of wood found in the District of Malabar.—The specimens are well prepared, but the value of the collection is unfortunately much reduced in consequence of no botanical names being affixed to them.

The jury cannot close their Report on the woods exhibited on this occasion, without calling attention to the number and variety of useful and valuable trees existing in the forests of this Presidency. Independent of the many reported to be useful in medicine and the Arts, the large number of handsome and ornamental trees and others yielding valuable timber, cannot but strike one in looking through these lists and reports. The Districts under the Presidency which abound in useful woods are Canara, Malabar, Salem, Cuddapah, Coimbatore, Tinnevelly, Guntoor, Vizagapatam, and Ganjam.

It is to be regretted that on this occasion no collections have been forwarded from Salem or Cuddapah.

Of the many useful woods standing in these forests, a very few only have been in common use for domestic and agricultural purposes among the native population. It is singular that up to a very late period,—it may almost be said that up to the present time,—the servants of Government in the Public Works Department have taken little interest in any but the teak, palmyrah and mango woods—all other woods were classed under the general denomination of jungle woods, and some of the finest timber of the world, thus named, have been applied in the construction of buildings which having been considered temporary were not thought deserving of teakwood roofing."

There can be no doubt but that up to the present time the waste of timber in every part of the country has been very great.

The attention of Government has been lately directed to the preservation of forests chiefly and prominently to teak, sandal, and other woods of known value, and it may be hoped that one result of these interesting exhibitions may be to convince Government and society at large of the immense value of property standing in our forests in the shape of trees of great variety and less useful qualities perhaps than teak, but, in some cases, and for some purposes, even superior to that wood. Many of these timbers being not only heavier but stronger, and possessed of higher elasticity than teak.

The first serious enquiries into our forest resources that seem to have been made originated in the demand for Railway sleepers.

Some difficulty appears to have been experienced at first in getting Agents to contract for supplies. The jungles were unknown to all but a few naked wood cutters who alone appeared capable of resisting the fever; the demand for these durable woods among the native population was too limited for any man of capital to think of entering upon the business.

Mr. Sullivan, Sub-Collector of Vellore, appears to have taken a lively interest in the matter, and to have organised a system for working the jungles of Salem and South Arcot bordering upon his own District. He has supplied the Railway Company with about 54,600 sleepers, most of them woods of the best quality. The price of these, varying from $2\frac{3}{4}$ to $3\frac{1}{2}$ cubic feet in contents, has been on an average Rs. 3-2.

A list was given in the Report of the Jury for 1855 of the woods sanctioned for use on the Railway. It was as follows:

1. Teak.	14. Carroo Vengay or Chella woongay marum.
2. Saul.	15. Parumbay marum.
3. Sissoo.	16. Eroovaloo marum.
4. Pedowk.	17. Vel Vengay marum.
5. Kurkuttah.	18. Peela marum.
6. Kurramurdah.	19. Dud Eloopay marum.
7. Maroothy marum.	20. Kurvalum marum.
8. Aucha marum.	21. Coombadrce.
9. Vengay marum.	22. Katoovoyee.
10. Kadookoy marum.	
11. Keenee marum.	
12. Myladee marum.	
13. Sem marum.	

A late report, of which the following is an Extract from the Resident Engineer of the portion of the line open, shows the extreme importance and the great difficulty attending the selection, and even the recognition, of the several varieties of woods.

"You will observe that out of 1507 sleepers, the "number actually removed, I have been able to get "the names of only 487. I have already mentioned "to you the very great difficulty that I have in get-

" ting anything like an accurate account of the des-" cription of sleepers removed, owing to the fact " that no two of the ordinary village carpenters " will give me the same name for a sleeper, and I " have not therefore been able to have the sleepers " examined as they were taken out of the road. It " was not until the end of the year that I was able " to avail myself of the services of a carpenter who " seemed to know more about the woods than " the generality, and of course by that time the great-" er number of the removed sleepers were not to be " found; but I hope the number given in this state-" ment will answer the purpose for which it is " required.

" Of the 487 sleepers examined, as many as 458 " are reported as being of unauthorised woods. This " is of course owing to the ignorance of the only " persons the Engineers could procure to name the " woods or possibly to their being bought over by " the Contractor. To my personal knowledge, the " sleeper contractors tried every expedient to pass " bad woods upon us, and I have myself, when in " charge of District 3, been more than once deceiv-" ed by sleepers which were brought to me care-" fully sawn of the exact dimensions and of great " weight and apparent hardness. The carpenter " I employed for the purpose gave them names which " were authorized and I passed them: these I after-" wards found were of Thaine wood, and had for a " long time been steeped in water to make them " heavy and solid looking. After a short exposure " in the Road, they dried and began almost immedi-" ately to decay, and in removing any that are found " now they are for the most part dug out with a " Mamooty, being so soft.

" From the number of these woods in the 1st and " 2nd Districts I have no doubt that the Engineers " of these districts were taken in, the same way that " I know myself to have been.

" Of the authorized woods removed, there are " only 29 out of 487; and of these 29, only 2 were " rotten, the remainder being split.

MADRAS RAILWAY—MADRAS DIVISION.

Number and Description of sleepers taken out and replaced from 1st July to 31st December 1856.

NAME OF WOOD.	No. Rotten.	No. Split.	Total number examined.	Total number taken out.	REMARKS.
DISTRICT NO. I.					
Thanie, *Terminalia* ?	182	...			
Otheyen, ...	71	...			
Goompany, *Odina Wodier*, ...	14	...			
Kurkuttah, *Ziziphus glabrata*	...	7			Ballast all Laterite.
Cadookoy, *Terminalia Chebula*	...	3			
Dud Euloopay, *Bassia longifolia*	..	1			
	267	11	278	450	
DISTRICT NO. II.					
Thanie, ...	51	1			
Otheyen, ...	94	...			
Goompany, ...	1	1			Ballast the first half is Laterite, the rest whinstone and decomposed granite.
Kurkuttah, ...	1	5			
Dud Eloopay, ...	...	6			
Saul, ...	...	1			
	147	14	161	917	
DISTRICT NO. III.					
Thanie, ...	15	2			
Otheyen, ...	25	...			
Goompany, ...	1	...			Ballast is all granite.
Cadookoy, ...	...	1			
Dud Eloopay	...	3			
Saul, ...	1	...			
	42	6	48	140	
			487	1507	

The jury cannot doubt but that much good in this direction will be effected by the attention given to this subject in the general and local Exhibitious of this presidency.

A list, prepared with much care by Lieut. Beddome, exhibits several new kinds of wood found in the Godavery forest and is appended to this Report, the jury being of opinion that its publication is calculated to be extremely useful.

The contributions in this department deserving of special notice are those from

Malabar,
Poudicherry,
Madura,
Palghaut,
Coimbatore, and
Ootacamund;

and considering that in some of these cases the Collection has been made by a Goverment Officer, whose Official position rendered the task of collecting and arranging comparatively light, without in any degree detracting from the public spirit displayed by himself, the Jury have resolved on the following

JURY AWARDS.

1ST CLASS MEDAL.

Progressive Number.	Catalogue Number.	Name of Exhibitor.	Object rewarded.
		Monsieur H. de. Querret Sous Ingineer Pondicherry.	Collection of Woods.

2ND CLASS MEDAL.

Progressive Number.	Catalogue Number.	Names of Exhibitors.	Object rewarded.
		Kristina Chettiar, Palghaut.	Collection of Woods.
		Kistniah Maramut Superintendent, Coimbatore.	do.

HONORABLE MENTION.

Progressive Number.	Catalogue Number.	Names of Exhibitors.	Object rewarded.
		W. Robinson Esq., Acting Collector of Malabar,	Collection of Woods.
		R. D. Parker Esq., Collector of Madura,	do.
		Mr. McIvor, Superintendent Botanical Gardens, Ootacamund.	do.

T. T. PEARS,
Reporter.

TELOOGOO CATALOGUE OF TREES

Indigenous in the Godavery Forests and the Circars between Bhadrachellum and Condapilly, by Lieut. R. H. Beddome, Assistant Conservator of Forests.

Teloogoo Names.	Botanical Names.	Remarks.
Arree	Bauhinia racemosa	Wood not used—slow matches are made from the fibre.
Andugu	Boswellia glabra	Wood soft and useless.
Allee	Memecylon tinctorium,	Wood only used for fuel.
Ansandra	Acacia ferruginea,	Wood very hard and useful : this tree is very like " Prosopis spicegera" when only in leaf.
Arawee Neem	Sclerostylis atalantioides,	This tree I found in the Circars only. Wood yellow and very hard, might be used as a substitute for box : it is always small though.
Balsu	Canthium parviflorum,	A dark colored hard and pretty wood—good for turning.
Barrauki	Trophis aspera,	On the mountains it grows to a large size-wood, only used for fuel.
Burugu	Salmalia Malabarica,	A soft useless wood.
Barë Kälä goru	Spathodea Roxburghii,	Wood is said to be useless. Roxburgh however says that it is used for various purposes. Buffaloes are very fond of the leaves.
Boja Godavery Forests Kouda taugedu (Circars.)	Inga xylocarpa,	A valuable timber, grows very large on the mountains.
Bilugu	Chloroxylon Swietenia,	The satin wood.
Bhut ànkhoosam	?	Wood reddish, said to crack soon.
Buta karamee	Nauclea parviflora,	Wood close grained and hard.
Buda darmee	Careya arborea ?	Wood soft and useless. Slow matches are made from the fibre.
Badama	Terminalia Catappa,	Wood very strong.
Boma maree	Ficus asperrima,	Wood useless.
Botku	Cordia new species	A very beautiful wood. It would answer as a substitute for Maple for picture frames &c., This tree is abundant in the Godavery Forests near Mahadeopore : it does not extend down to the Circars. It is found near Warungul. It also is indigenous to the Jubbulpore forests, where it is called " Deyugan." It is I feel certain the tree described by Dr. Griffiths as " Hemigymma Macleodii." He described it from dried specimens and thought that the leaves were opposite (instead of alternate) otherwise his description and Native name agree.
Baudaru	See paspoo Karamee	
Chiuta	Tamarindus Indica	The tamarind tree, a beautifully grained wood.
Chilla	Strychnos potatorum.	A very hard and close grained wood.
Chitla Matta	Gardenia gummifera.	A small tree. The wood is hard. The natives eat the fruit.
Chaudam	Pterocarpus santalinus.	A hard red wood, not found on the right bank of the Godavery.
Chilka dudugu	Guatteria cerasoides	Appears to be a tolerably hard wood and does not seem to warp. The natives however on the Godavery do not use it, and say that it is soft.
Chinangee,	Lagerstroemia parviflora,	Wood said to be good.
Chinna morillee,	Buchanania latifolia,	Wood considered useless.
Chinna norer,	Eugenia Salicifolia ?	Wood not used except for fuel.

Chinna gomudu, Chinna goomar,	Gmelina asiatica,...	A small tree. Wood only used for fuel.
Chinna kâlinga,	Dillenia pentagyna,	A very strong hard wood, abundant on the Indrawatty and in jungles on the left bank of Godavery; not known on the right bank.
Chillankee,	Inga umbellata,	Found only in the Circars. I did not examine this wood.
Chinna botku,	Cordia augustifolia,	Wood used for posts and in house building. This tree is common about villages in the Circars, but I never, I think, saw it in the jungles.
Chinna nowlee,	Niebuhria linearis	Wood useless—only found in the Circars,
Dumparee (Godavery Forests) [Goompiuee (circars)]	Odina Wodier...	Wood said to be soft and useless by the natives. That of old trees is I believe tolerably strong.
Duria maddee also kora maddee and koraman..	Briedelia spinosa...	Wood appears to be very strong and good. Cattle eat the leaves most voraciously.
Dundillam,	Calosanthes Indica,	Wood soft and useless.
Dulchirram,	Acacia Halkora,	An enormous tree. Wood hard and reddish.
Dudippa (Godavery Forests) (Chetippa circars)..	Hymenodyction	A large tree. Wood not used in the Godavery forests.
	H-Excelsum? the stipules are gland tipped not serrate. If it is H. thyrsiflorum of Roxburgh—it is probably not distinct from H. Excelsum	In the Circars all native gun stocks are made from the timber of this tree. The bark, which is intensely bitter when fresh, is used near Bhadrachellum as a febrifuge.
Deowidaree,	Sethia Indica,	Wood reddish hard—it is little more than a shrub.
Gadda nellee,	Celtis orientalis,	A worthless wood.
Googal,	Shorea robusta,	Abundant on the banks of the Indrawatty—a valuable timber. This tree yields the dammer.
Gara,	Balanites ægyptiaca. B. Indica,	Wood only used for fuel.
Gooanku,	Randia uliginosa,...	Wood said by the natives to be useless.
Garugu,	Garuga pinnata,	Wood soft and useless.
Goomar tek,	Gmelina arborea,...	The large trees of this yield a very hard durable wood. The yoke for Bullocks is made from it.
Gotee,	Zizyphus xylopyrus,...	Wood said to be soft, except from the large trees.
Ippee,	Bassia latifolia,	A strong wood, but never felled by the natives,—the flowers yield a toddy, and an oil is extracted from the seeds.
Irkee (Godavery), Pedabotku (Circars)	Cordia myxa,...	Wood never used by the natives in the Godavery forests. In the Circars ploughs are made from it.
Jooree	Ficus Tsiela,	Wood useless and soft.
Jana palseru	Antidesma paniculata,..	Wood never used, it seems tolerably hard.
Jitegee [Godavery Forests] Yeroogoodoo [Circars]	Dalbergia latifolia,	A valuable mottled black timber.
Jidi Mamidi	Anacardium occidentale,	Only about villages and rare.
Jiree	Semicarpus anacardium,	A soft useless wood.
Jana	Grewia Rothii?	Wood very hard and much used in the Circars.
Jammee...	Prosopis spicegera,	The natives say that this wood is very inferior. This is very different to Dr. Wight's account. May his specimens not have belonged to acacia ferruginea?
Kanregu	Flacourtia sapida;	A very hard close grained wood which does not warp—worthy of attention.
Karingá (Godavery Forests) [Tellá Manga circars]	Gardenia lucida,	Wood not used on the Godavery but it is in the Circars. It seems to be very hard and close grained and adapted for turning.
Koree (Godavery Forests) [Korivipal (circars)	Ixora parviflora,	A hard wood.
Karpà	Barringtonia acutangula,	Wood useless.
Koorseea—Koorsee	Cluytia collina,	Wood very hard and reddish.

Teloogoo Names.	Botanical Names.	Remarks.
Kálà goru (Godavery Forests) also Chinna Kala goru Mokkà Yàpà (circars)	Bignonia sp: ... ... Stercospermum not sp, ...	A useful wood—abundant in the Mahadcopore forests; rare in the Circars. This appears undescribed. Leaflets 4 or 5 pair with an odd one—perfectly glabrous—entire or serrulate—ramifications of the panicle not decussate—glabrous large ensiform bracts at the ramifications—flowers inodorous shugua long slender.
Kàlà goru	Bignonia chelonoides, ...	A good fancy wood—abundant on the right bank of Godavery, I did not meet with this or suaveolens in the Circars.
Kàlà goru	Bignonia suaveolens,...	Wood very similar to B: chelonoides, but of a redder hue.
Kondà bodagâ	?	Wood softish—a large tree with lanceolate leaves. The bark of this tree is very glutinous when peeled off, it is bound on wounds and said to be very healing.
Kumkumà	Rottlera tinctoria...	Wood said to be useless.
Karcheeà	Nyctanthes arbor tristis, ...	A hard useful wood—does not attain much size.
Kal mesura	Cascaria tomentosa, ...	Wood said to be of no value—it soon splits.
Karakà	Terminalia chebula, ...	A very hard valuable timber.
Kanigu	Pongamia glabra,...	Wood said to be strong, it does not appear to be used.
Kondà gogu	Cochlospermum gossypium,...	Wood useless.
Komee	Stylocoryne Webera, ...	Wood prettily marked and hard—much esteemed by the natives—it is very small however.
Kankadu	Sapindus emarginatus, ...	A yellowish prettily grained wood—it is tolerably hard.
Konda Mámiri [Circars only]	Protium Roxburghiana....	Wool not used. The leaves and every part of the tree possess a strong smell like mangoes.
Koila Mookree (Circar's and lower avery God jungles)	Wrighte a tomentosa	Wood not used—it appears close grained. The juice is a permanent yellow dye. Bark given internally for scorpion bites.
Lolugu	Ptereospermum hynea?...	Wood pinkish and hard, it is generally hollow in the centre.
Mauchee jamudu	Euphorbia tirucalli, ...	Grows to a large tree. Wood seems hard but is not used.
Mamari	Mangifera Indica....	The Mango tree.
Mushtee or Musadee	Strychnos nux vomica, ...	Wood very hard and strong—white ants will not touch it.
Mulaka	Hyperanthera Moringa	(Only about villages) wood said to be useless.
Maredu	Ægle marmelos, ...	Wood very strong. The native dhol is made often from this wood.
Marree	Caryota urens, ...	Abundant on the banks of the Indrawatty—it yields a wine and also a meal like sago.
Makkam	Schrebera swietenoides, ...	A very hard valuable wood—it never warps.
Moonee Motku	Eryta suberosa, ...	Wood soft and useless.
Motku (or modagu)	Butea frondosa, ...	Wood said to be useless—it yields a bright red gum.
Morillee [see peda and chinna Morillee] ...		
Mauda	Randia dumetorum, ...	Only used for fuel.
Marree	Ficus Indica, ...	The drops of this tree yield a heavy hard timber.
Muchi twikee (Godavery forests) Warungul...	Diospyros: sp, ... *female* flowers with 4 anthers, the filaments inserted on a receptacle below the germ berries 8 celled—*male* flowers anthers 16-18 filaments 2 3 cleft each division with its anther, ...	A very hard light colored wood.
Nerar	Syzygium jambolanum, ...	Wood said to be strong.
Nar yepa (Godavery)	Hardwickia binata, ...	Wood red, very hard and heavy; often hollow in the centre,

Yepi (Circars.)	(Most abundant in Godavery Forests.)	(This is Bauhinia diphylla—M. Exhibition report.)
Nalla maddee,	Terminalia tomentosa also T. coriacea.	Valuable well known timbers.
Nara botku,	Eriochlena Hookeriana,	A strong hard wood—(something like the Botku, a new species of Cordia.)
Naooru also Nagool,	Fremna tomentosa,	A pretty looking wood—worthy of attention as a fancy wood.
Nulla sandra,	Acacia sundra,	A very hard wood—on the Godavery the musal is always made from this wood.
Namillee (Godavery.) Nowlee (Circars)	Ulmus integrifolia,	The natives say that the timber is useless—appears to be hard however.
Nulla kaka mushti, (Circars only.)	Diospyros sp, ... D. Sylvtic a ?	Wood whitish and very hard.
Nalla mauga, (Circars only.)	Randea sp,	Wood very hard and close grained—a good wood for turning—(a good sized tree armed.)
Nulla balsoo (Circars)	Acacia amara,	Wood said to be hard. I did not examine it.
Nulla regoo (Godavery Forests) Narlingee (circars)	Canthium didymum,	Centre wood mottled and of a dark color like old seasoned oak.
Nakeera,	Ximenia americana,	Wood only used for fuel.
Nowlee eragoo,	Vitex arborea...	Wood hard of a yellowish brown color.
Nalla muddee,	Maba buxifolia,	Very small—but a hard pretty wood.
Pashee also Paunchee,	Anogeissus acuminatus,	A very strong hard timber.
Peda sopara (Godavery Forests, Yerra patsaroo (circars)	Dalbergia frondosa....	A strong useful timber.
Porilla sopara (Godavery) Tella patsaru (circars)	Dalbergia paniculata,...	Wood perfectly useless—it is arranged in rings with softer substance in between in layers.
Pal dautam (Godavery) Peda pul mera (Circars)	Ehretia lœvis,	A hard valuable wood, not of great size though.
Peda Karinga,	Gardenia latifolia,	Wood close grained; promises well for turning.
Papirree also Papatta,	Pavetta tomentosa,	Wood hard but very small.
Pedda mau,	Ailanthus excelsa,	Wood soft, never used by the natives.
Paspoo Karamee (also Bundaroo)	Nauclea cordifolia,	A yellowish valuable wood; that of the very large trees is very superior—from smaller trees it seems rather soft.
Pul-i-shinta,	Bauhinia: sp,..	Said to be a good hard wood—not apparently described. Legume filled with a scented pith.
Palla, also peda palla,	Mimusops hexandra,	Wood very hard.
Poosku	Schleichera trijuga, (Mostabundant in Godavery forests.)	Wood hard heavy and strong. The large musal for pressing the Sesaurum Oil is always made of it—also ploughs.
Peda kalinga,	Dillenia speciosa,	A very hard wood. In jungles on the N. of Godavery.
Peda dulchirram, (Godavery.) Dirasau (Circars.)	Acacia speciosa,	A valuable timber.
Pedda chilka dudugu,	Uvaria tomentosa,	A very strong yellow wood, much similar but superior to "Nauclea cordifolia." Cowars are made from it—also used in House building—it does not warp.
Pedda aree,	Bauhinia purpurea,...	Wood softish.
Pedda mosillee,	Buchanania augustifolia,	Wood not used, seems rather hard.
Palla also chinna pala,	Holarrhena antidysenterica,	Wood worthless.
Peda kal mesura,	Casearia sp,	Wood light yellow, hard, does not warp—worthy of attention. A large tree—leaves ovate, oblong, glabrous serrulate flowers 8 anthers capsule 3-valved with 3 ridges on the outside of fruit. Fruit used to poison fish.
Passar giuce (same as Nalla saudra which see.)		
Pauteugee,	Briedelia montana,...	Wood hard, dark colored—small tree.

TELOOGOO NAMES.	BOTANICAL NAMES.	REMARKS.
Patcha botku (circars only)	Cordia polygama	Strong elose grained wood (small and crooked)
Poonkee	Gyrocarpus Jacquini	Wood soft and light, much used for making cowrie boxes and toys, takes paint aud varuish well. Tella poonkee " Givotea rottleriformis" is used also for the same purposes.
Reyla	Cathartocarpus fistula	Wood said to be strong.
Reygutti	Capparis grandis	Wood very hard and good.
Benga	Zyzyphus jujuba	Wood strong and much used by the natives.
Baee	Ficus religiosa	Wood useless.
Seetapal	Anona squamosa	Covers miles of country in the Dekhan. The custard apple.
Soonaree	Ochna squarrosa	Wood reddish and pretty, but it warps and splits. The juice of the wood applied to sores.
Sheriman	Anogeissus latifolius	Wood said to be one of the hardest in the forests. It grows to an enormous size. Axils of carts generally made of this.
Soomee	Soymida febrifuga	Wood very hard and valuable—never rots under ground—very much used in building—of a reddish color.
Sopara—(see peda and porilla sopara,)		
Tek	Tectona grandis	The teak tree.
Tella Maddee	Terminalia glabpee	A well known timber.
Torelaga	Limouia acidissima	Wood very hard—worthy of attention.
Telega (Godavery forests and Dekhan)	Gardenia sp: Bark whitish mealy swollen. Leaves with mealy down underneath. Fruit globose, size of a cricket ball, not crowned with any portion of the coly.	Wood very hard, would be very good for turning.
Thaudee	Terminalia Belerica	Wood useless.
Tharra	Grewia tiliæfolia	Grows very large on the mountains—a valuable timber—much used for haudles of axes, pellet bows—cowars walking sticks.
Tunkee (Godavery) tookee (circars)	Diospyros melanoxylon	The centre wood black and very heavy. The Godavery ebony.
Tella motku	Dalbergia Oojeineusis	Wood valuable—it is rather rare.
Thabsee	Sterculia urens	Wood soft and useless.
Tella sopara, (Godavery forests only.)	Acacia elata	Wood strong and much valued.
Telsoo (Godavery) Shinduga (Circars)	Acacia odoratissima	A valuable well known timber.
Togaree Mogillee (Godavery) Mogillee (Circars.)	Morinda exserta	Wood hard and useful, does not warp.
Teila saudra	Acacia suma	Wood very good and strong—abundant in the Aukecsáh jungles.
Teegur Motku, or Modagu	Butea superba	Wood fibrous and useless.
Tella tuma	Acacia leucophlæa	Wood hard—it is used for various purposes by the natives.
Tuma	Acacia Arabica	Wood valuable and well known.
Tella Manga	Gardenia lucida	A close grained wood. I think it well adapted for the lathe.
Tedla pal	Wrightea tinctoria	A beautiful wood, hard and like ivory—most valuable for turning.
Tella kaka Mushtee, (Circars only.)	Sponia ? Appears to be Celtes Wightii of Wight's Icones.	One of the hardest woods I have ever met with—light colored, well worthy of attention.
Tella poonkee (Circar hills only)	Givotia Rottleriformis	A very light soft wood—See remarks under Poonkee.

Usarka,............	Emblica Officinalis, ...	A hard valuable wood.
Ulinda also Yelinda,............	Diospyros chloroxylon?	A very hard useful wood, grows to a large tree on Circar mountains; it is generally a shrub about the Godavery forests.
	Armed leaves lanceolate oblong downy. *Male*, 16 anthers one above the other on generally 16 filaments. *Female*, 9 anthers (sterile?) stigmas 4-5 germ 8-10 celled. Berries 3 seeded.	
Uskia Man (Godavery) Uri-widdee (circars)......	Cratoeva Roxburghii....	Wood very hard. The native dhol is often made of this wood.
Udugu,............	Alangium decapetalum, ...	An ornamental, beautiful wood—attains a fair size in the forests.
Wodee,............	Spathodca Rheedii, (Bignonia spathacea Roxburgh.)	Wood strong, whitish.
Wanza (Godavery) same as Gadda Nellee (of Circars) which see.		
Yeggee,............	Pterocarpus—marsupinum, ...	A well known timber. The native dhol is often made of this.
Yepa also Yapa,............	Azadirachta Indica, ...	A valuable timber.
Native names unknown...,............	Sterculia colorata (Godavery forests,)...	Wood useless.
	Bignonia xylocarpa, ...	Wood very hard, tree rare in Godavery forests.
	Putranjiva Roxburghii	A close grained very hard valuable wood. The tree is any thing but common.
	Grewia nudiflora,...	Wood said to be only used for fuel.

TIMBER WOODS FROM AMHERST AND TAVOY PROVINCES, AND MERGUI ARCHIPELAGO, RECOMMENDED FOR HELVES, BY CAPTAIN DANCE, DEPUTY COMMISSARY OF ORDNANCE TENASSERIM PROVINCES.

1. LAGERSTRÆMIA PYMMAH. Peema Nee. *Red Peema.*

Maximum girth 6 cubits. Maximum length 30 feet. Very abundant; found all over the Tenasserim and Martaban Provinces. When seasoned, floats in water.

Remarks.—A tough wood, very good for helves, already used for such, and for other Ordnance purposes. The great fault of Peema is its liability to shrink and warp when exposed to the sun or to heat. Peema however has not been fairly tried, if killed and left standing as Teak the tendency to warp might probably disappear.

2. CALOPHYLLUM LONGIFOLIUM. Therapee.

Maximum girth 3 cubits. Maximum length 22½ feet. Abundant; found in Mergui, Tavoy, and in lesser quantities near the Attaran River and its branches. When seasoned, sinks in water.

Remarks.—Used for masts and yards of Junks, excellent for helves but not procurable at Moulmein in sufficient abundance. Strongly recommended to make models.

3. TEE KA LOUNG or THA or KADATGHEE. Burm.

Maximum girth 3 cubits. Maximum length 22½ feet. Abundant; found at Mergui and Tavoy. When seasoned, floats in water.

Remarks.—Used for bedsteads, and for house building. Recommended as a durable, tough wood for helves or for hammer handles.

4. SIBIA GLOMERATA. Thayt Pew Tha or White Thayat.

Maximum girth 5 cubits. Maximum length 30 feet. Abundant; found on the sea coast from Amherst to Tavoy, and Mergui. When seasoned, floats in water.

Remarks.—The term, Thayat-pew, should be cancelled from the collection, Thayat Pew, meaning white wood, a name equally applicable to "Calophyllum longifolium," "Dillenia speciosa" and Dalbergia *species*, and other woods, "ye-man-nee," is often called by this name. The name Pyew is however that of Mangrove in Mason's "Tenasserim" and I cannot succeed in procuring the true Mangrove.

5. ARTOCARPUS ECHINATUS. Mountain Jack or Tong By-ne. Burm.

Maximum girth 5 cubits. Maximum length 30 feet. Not abundant though to be found here and there over a large expanse of country; found all over the Tenasserim and Martaban Provinces. When seasoned, floats in water.

Remarks.—This wood found on seasoning too light and spongy for durability, should be classed as a useless wood.

6. XYLOCARPUS GRANATUM, Penlaypyoung or Peng-lay-oun. *The sea cocoanut.*

Maximum girth 5 cubits. Maximum length 20 feet. Very abundant; found all along the sea shore from Amherst to Mergui. When seasoned, floats in water.

Remarks.—Used by Burmese for all parts of houses, posts, flooring, walls &c. A very good, fine grained strong wood, splits with difficulty. Recommended for handspikes, helves, spokes, and handles of tools, also for shot boxes and packing-cases.

7. HERITIERA LITORALIS, Konzozaloo or Kanazoe, from the sea shore.

Maximum girth 4 cubits. Maximum length 30 feet. Very abundant on the Islands; found on Pannat Island and all the Mergui Archipelago, also all along the coast of Amherst province. When seasoned, floats in water.

Remarks.—Used for Boats, Boxes, planks of houses &c. a very light wood, scented, durable and tough. Recommended for fuzes beyond any other wood in the collection: also for helves, and for gun stocks. Strongly recommended for packing cases of all descriptions.

8. HERITIERA MINOR, Kanazoe, a Forest Fruit tree.

Maximum girth 2 cubits. Maximum length 15 feet. Very abundant, but straggling; found in Martaban, and on both sides of Moulmein river, and all along the sea coast; an unlimited supply of this procurable. When seasoned, floats in water.

Remarks.—Name of this sounded as the other Konnayzow but the wood different. When seasoned, it is tough, light and durable. Used for bows also piles of bridges, boats, and many other purposes. Recommended for helves, but should be killed a twelve month before being cut down, or otherwise should be seasoned by keeping after it has been cut down. Both of these "Kanazoe" woods said by Dr. McClelland to resemble Soondree wood in strength and durable qualities.

9. KANNAN THA or CRAB TREE.

Maximum girth, 4 cubits. Maximum length 30 feet. Abundant; found on an Island called Pielo

Island near Mergui, but scarcely procurable in Moulmein. When seasoned, the red variety sinks and the white floats.

Remarks.—Used for houses, zyats &c. a very durable wood of handsome grain ; of this wood, there are two kinds, red and white. The latter lighter than the former, likely to answer for helves ; the former too heavy for that purpose. Both woods very good for turning purposes.

10. KAYA NAN in Tavoy, Kaiyah in Moulmein. N. B. The wood called Kyanan in Moulmein and by Mason, is Tavoy red wood, Syndesmus Tavoyana.

Maximum girth $2\frac{1}{4}$ cubits. Maximum length 15 feet. Very abundant ; found on the sea coast, from Amherst to Mergui : also on banks of rivers in the Province of Martaban near the sea. When seasoned, floats in water.

Remarks.—One of the best woods in the country for helves ; tough, light, very durable, plentiful ; long in the fibre, neither liable to split nor to warp nor to break readily. Used by Burmese for planes, spears, boats, stocks of guns and all kinds of purposes. This wood is of a most beautiful color, a combination of Pink cream color and red, and bears a very high polish. Recommended for helves, handles of tools, handspikes and spokes of gun carriage, and timber wheels : also for gun stocks and planes.

11. PARRAWAH.

Maximum girth 3 cubits. Maximum length 22 feet. Abundant ; found all over Tenasserim and Martaban provinces. When seasoned, sinks in water.

Remurks.—A durable smooth-grained tough wood ; used by Burmans for sticks, helves for pick-axes, and hoes, handles of chisels and other tools &c. Recommended for helves and handles of tools generally.

12. THA BYKE or THA-BAY-KYA, A kind of Oak.

Maximum girth $1\frac{1}{2}$ cubits. Maximum length 16 feet. Not abundant, but scattered ; found in all forests inland, all over the provinces. When seasoned, floats in water.

Remarks.—A sufficiently light, yet durable, straight grained, tough wood ; used by Burmese for posts, building purposes generally, and various other objects. This wood is recommended as likely to prove excellent for helves, and if it could be procured in sufficient quantities, would be unrivalled for shot boxes.

13. GONGOO or GANGAW.

Maximum girth 3 cubits. Maximum length 32 feet. Very abundant ; found near Mergui, also thence along coast as far as Amherst. When seasoned, floats in water.

Remarks.—Used for tables, chairs and miscellaneous articles by the Burmese ; a good, hard, tough wood, durable, and recommended for helves also for handles of all kinds of tools. Vide Major Simpson's Report.

14. ANCESTROLOBUS CARNEA ; Toungalay in Martaban Provinces, Zeengalay in Tavoy.

Maximum girth 3 cubits. Maximum length 30 feet. Not abundant ; widely scattered. Found all over the Provinces in the forests, but in none abundant. When seasoned, floats in water.

Remarks.—This wood has a good long fibre, tenacity, durability and sufficient lightness, is very free from knots ; used by Burmese for building, for ploughs and for utensils of all kinds. Recommended for helves and for handles of chisels, hammers and tools generally—said by Dr. McClelland to be plentiful in Pegu and Tonghoo Forests, but rarely to exceed 3 feet in girth.

15. BONG LONG THA.

Maximum girth 3 cubits. Maximum length 22 feet. Said to be abundant, but has not been easily obtained in Moulmein. Found all over the provinces. When seasoned, floats in water.

Remarks.—A durable yet light wood with a very straight grain ; used for every purpose by the Burmese, and much recommended for helves.

16. THANAT KHEE.

Maximum girth $3\frac{1}{2}$ cubits. Maximum length 30 feet. Said to be abundant, but has not been easily obtained in Moulmein. Found all over the provinces. When seasoned, floats in water.

Remarks.—A durable yet light wood with a very straight grain ; used for every purpose by the Burmese, and much recommended for helves.

17. TAY-THA.

Maximum girth 3 cubits. Maximum length 16 feet. Scarce in Amherst, but abundant towards Tavoy. Found inland, also along sea coast all over the provinces. When seasoned, floats in water.

Remarks.—Found subject to dry rot when seasoned ; a useless wood not recommended.

18. MAI TAI YO. Maximum girth $2\frac{1}{2}$ cubits. Maximum length 22 feet. Abundant. Found all over the provinces. When seasoned, floats in water.

Remarks.—Used for posts and many other purposes by the Burmese, a particularly good wood for helves, being durable, light, and tough.

19. KYA MOUK, a kind of Oak. Maximum girth 4 cubits. Maximum length $22\frac{1}{2}$ feet. Abundant but widely scattered. Found all over the provinces inland. When seasoned, floats in water.

Remarks.—An excellent tough wood, durable and sufficiently light ; used for all purposes by the Burmese. Strongly recommeded for helves, hammer handles, handspikes, staves of casks, and many other purposes, but too widely scattered to be easily obtained unless a large quantity be ordered which should repay a search in the forests : much used by Burmese as a pole for cavady baskets.

20. PA-KA-THAN.

Maximum girth 2 cubits. Maximum length 12

feet. Abundant, but widely scattered. Found all over these provinces inland. When seasoned, floats in water.

Remarks.—Used by Burmese to make paddles, oars, &c., a tough, durable, good wood, but too widely scattered to be easily obtained, unless a large quantity be ordered which would repay a search in the forests.

21 DILLENIA SPECIOSA. THEE-BEW-THA.

Maximum girth 3 cubits. Maximum length 22 feet. Trees abundant, but widely scattered. Found all over the provinces here and there inland. When seasoned, floats in water.

Remarks.—A durable, tough, light, wood, seeming very good for helves. Used by Burmese for building houses and for sundry other purposes; said by Dr. McClelland to afford large and good timber for building houses.

22. KYE-ZAI; LAURUS, *species.*

Maximum girth 2 cubits. Maximum length 15 feet. Scarce, not obtainable at Moulmein. Found along the coasts from Amherst to Mergui; also on the banks of Tavoy river. When seasoned, floats in water.

Remarks.—A very tough wood, which has already been often used for helves with great success. Proved of extraordinary strength and tenacity in former experiments. Very durable and not too heavy for helves. Recommended for helves and handles of tools of all kinds, if it could but be procured at Moulmein.

23. MYOUK SHO OR MONKEY TREE, also called *Moulmein Lancewood.* DALBERGIA (Mason), so called because its pole is so straight, so slippery, and to so great a height free from branches that no monkey was ever seen to climb it.

Maximum girth 4 cubits. Maximum length 40 feet. Very abundant. Found in Tavoy and Mergui: also somewhat abundant all over the provinces inland. When seasoned, floats in water.

Remarks.—A wood much praised in Tavoy, as resembling Lancewood in properties but found to split when seasoned, perhaps good specimens have not been obtained. At any rate other woods of unquestionable value are abundant in Amherst.

24. CAREYA ABOREA. BAN BAMBOOAI.

Maximum girth 3 cubits. Maximum length 15 feet. Abundant. Found all over the provinces inland. When seasoned, floats in water.

Remarks.—This timber is useful, durable and tough: used for posts of houses, and for country carts. Recommended for helves though better kinds for that purpose have already been specified. Recommended by Dr. McClelland with other woods as equal in strength in oak and of a promising kind for ship-building.

25. KYE YO THOO.

Maximum girth $2\frac{1}{2}$ cubits. Maximum length 15 feet. Very abundant at Mergui, but not procurable at Moulmein. Found inland up the rivers all over the Provinces. When seasoned, floats in water.

Remarks.—An uncommonly smooth grained, tough, close, yet not heavy wood. Durable and with but one fault, the smallness of its girth, unfitting it for gun carriages. Strongly recommended for helves and handles of tools of all sorts, if it can hereafter be procured at Moulmein; also for handspikes and for spokes. This wood, on careful examination, appears to be identical with Trincomallee wood, though this cannot be positively stated till the flowers of the tree can be procured.

26. SOW-YEW or Chisel handle tree, called by the Karens Egg tree, stated by Mason to be of the genus Dalbergia, *species* unknown. Maximum girth $2\frac{1}{4}$ cubits. Maximum length 10 feet. Not very abundant, but found scattered all over these forests inland; always found in undulating ground only not near water. When seasoned floats in water.

Remarks.—Used by Burmese in preference to any other for handles of chisels and tools, also for helves of axes, and hatchets. A very hard, fine grained, wood, which is strongly recommended for helves and handles of all kinds of tools. Unequalled for those tools, such as chisels, which are struck with a hammer or mallet. This wood is of a yellowish white in color with patches of black interspersed, looking as if Iron had in some manner been drawn from the soil, and incorporated in the wood. Though widely scattered, it is in such demand as always to be procurable in the markets.

27. SHOREA ROBUSTA. IN-JIN or EN-GHYEN, called in India, Saul.

Maximum girth, certainly 3, said to be 5 cubits. Maximum length certainly 20, said to be 30 feet. Abundant. Found inland in Amhrest and Tavoy provinces. When seasoned, sinks in water.

Remarks.—A thoroughly good and valuable wood. One of the most durable in these forests; tough, elastic, large, and extremely heavy. Used for bows and for all kinds of purposes, by the Burmese. Recommended for handles of hammers, chisels and other tools, also for sheave blocks, cogs, and machinery in which great strength is required: also for government buildings, wharves &c. especially for Railway sleepers, from its singular property of petrifying when long exposed to the action of water, as also from its abundance and large girth. Too heavy for helves, said to strike fire with steel, after having been kept in water for a length of time. Major Phayre stated in a letter his having found several logs of this wood in a creek which is empty in the dry season, all of them petrified. This saul appears a closer grained, better, and probably a heavier wood than the saul of India; it seems likely to answer admirably for helves, and for rammer heads, as well as for the other purposes already specified in this report.

28. MELANORIHEA USITATA. THEETSEE.

Maximum girth certainly 3, said to be 4 or 5

cubits. Maximum length certainly 20, said to be 30 feet. Very abundant. Found in Amherst Province. When seasoned, floats in water.

Remarks.—A wood of particularly fine close grain, exuding a black gum which repels ants, and is used by the Burmese as a varnish. Very strong, durable, hard and tough, found to answer well for cogs of machinery. (Vide Artillery Records with report of woods by Captains Simpson and Babington, dated Moulmein 25th May 1842.) Recommended for handles of tools, also for sheave blocks and for machinery generally and for Railway sleepers. Dr. McClelland writes of this wood as follows:—"The Lignum vitæ" of Pegu. It is of a dark red color, of a close grain and dense structure. Its great hardness and weight prevents it being employed in house building. It would answer for sheave or block pulleys and other purposes connected with machinery, where great strength and density are required. The anchors of Burmese boats are always of wood to which stones are lashed. The flakes being of Pyeng Khadœ the stocks of Theetsee or of some other heavy wood. This wood is not brought to Moulmein so heavy as Dr. McClelland describes it. It is procurable at 7 cubits and on high or low ground. Recommended for gun stocks, also for rammer heads, and for helves, *in short* for all purposes as so strong yet not very heavy.

29. FRAGÆA FRAGRANS, ANNAN-THA or *Annan.*

Maximum girth 4 cubits. Maximum length 20-25 feet. Very abundant. Found in the provinces of Amherst, Tavoy, and Mergui: also on islands of the Coast and inland, especially up the Attaran river. When seasoned, sinks in water.

Remarks.—Building houses, Kyoungs, Zyats, &c. also for piles of bridges, wharves &c., but for the last by the English only, as Burmese think this wood too good for any but sacred purposes: hence Annan wood has been more preserved in these forests than any other valuable wood. It is impervious to the attacks of ants, and of the teredo navalis which will eat all other timber. At Tavoy the posts of a wharf which have for several years been partly dry and partly wet, each day according to the state of the tide, are untouched by the worms. The Burmese have a proverb about the slow growth of this tree. Annan wood though almost imperishable is not capable of bearing so heavy a strain as some of the other valuable woods of the province. (*Vide Artillery Records for* 1844, and experiments therein recorded, page 531 of "Selections.") Recommended for Railway sleepers, as neither heat nor moisture will warp or rot it.

30. HOPEA ODORATA. THINGAN.

Maximum girth 6 cubits. Maximum length 60 feet. Scattered but abundant. Found in the Provinces of Yea on the coast beyond Amherst, also at Mergui, and in lesser quantity near Moulmein. When seasoned, floats in water.

Remarks.—Formerly considered the most valuable indigenous timber in the southern Provinces. Used at Tavoy and Mergui for building houses: used also for canoes, junks, &c. A very durable excellent wood when kept under water as in the planks of a boat or under cover on land; but often liable to split when exposed to the sun in a dry state. Recommended for helves.

31. INGA XYLOCARPA. PYENG KHADOE. Maximum girth 3 or 4 cubits. Maximum length 20 or 25 feet. Very abundant. Found all over the Tenasserim province also at Mergui and Tavoy. When seasoned, sinks in water.

Remarks.—This the Iron wood of these provinces, resists nails, which cannot be driven into it. Used for crooks of ships, posts, piles, bridges, &c. Recommended for handles of chisels, gouges, &c. but too heavy for other ordnance purposes. Excellent for railway sleepers. The only Pyeng Khadoe which I can procure here (and I have had many specimens) has been eaten by worms in seasoning, and proved inferior. I suspect that the real Pyeng Khadoe has not yet reached me.

32. HOPEA ODORATA. THINGAN PEW, or white Thingan.

Maximum girth 4 cubits. Maximum length 30 or 40. Scattered but abundant. Found in the same localities as the red Thingan. When seasoned, floats in water.

Remarks.—A lighter variety of the red Thingan. This is a tolerable wood for durability, and would do for helves, but more suitable woods are in the list of those recommended.

33. ACACIA ELATA. THAEET THA.

Maximum girth 4 cubits. Maximum length 18 feet. Very abundant. Found all along the sea shore from Amherst to Mergui. When seasoned, floats in water.

Remarks.—Used for posts of buildings, a very durable wood; abundant and of such girth, might be advantageously employed for packing cases, also, for government buildings in Burmah. Recommended by Dr. McClelland for cabinet making.

34. PET-THAN.

Maximum girth and length not ascertained. Abundant in Tavoy, not procurable in Moulmein; found in Tavoy and Mergui. When seasoned, sinks in water.

Remarks.—A very hard and durable wood, used by Burmese for wedges. Not recommended, because only procurable at Tavoy and Mergui.

35. MEZZALEE. Maximum girth 4 cubits. Maximum length 30 feet. Scattered, not very abundant. Found all over the Provinces. When seasoned, floats in water.

Remarks.—Used by Burmese for rulers, mallets and walking sticks; of very handsome streaked grain like palmyra wood, but not sufficiently durable to be recommended for ordnance purposes.

36. MEENABAN; APOCYNACEÆ, or Tavoy

Lance wood Classed by Mason as one of the apocynaceæ and called by him Tenasserim Lance wood.

Maximum girth 1½ cubits even in Tavoy and Mergui where largest. Maximum length 12 feet. In moderate quantities. Found from Tavoy, Mergui and adjacent islands; also in smaller scantling and scarce, in Amherst Province. When seasoned, floats in water.

Remarks.—Used by Burmese for bows, spears, walking sticks, dhar and chisel handles, &c. an excellent tough, hard, elastic and durable wood, bears a beautiful polish, and makes excellent furniture; when wanted in but small size only, much recommended for handles of screw drivers, hammers, planes, and all kinds of tools; also for all purposes for which a close grained heavy wood is required. (Vide Major Simpson's Report.) Does not seem to stand exposure to the direct rays of the sun well, but under cover is found to be a thoroughly good wood for Planes, for which this is especially recommended, also for screw drivers and all kinds of turning. This is good for all those purposes for which box is now imported.

37. LAURUS (SASSAFRAS). CARRAWAYTHA, or Sassafras wood. Maximum girth 3 cubits, rarely 4. Maximum length 20 to 30 feet. Not very abundant, but procurable. Found from Amherst to Mergui, all along sea coast at Yea, Henzay and other places. When seasoned, floats in water.

Remarks.—Used for interior of junks, also for inside works of drawers, boxes &c., as it has a smell which repels insects. A durable wood found, when seasoned and worked up, remarkably tough and strong, excellent for planes, helves and handles of tools generally, and would be excellent for almirahs in which to keep serge, hospital clothing &c.

38. POUK-THA OR THAN-YEN, Dr. McClelland reports probably Inga bijemina.

Maximum girth 3 to 4 cubits. Maximum length 22 feet. Widely scattered but abundant. Found inland all over the Provinces. When seasoned, floats in water.

Remarks.—An excellent and durable wood would do well for handles of tools. This wood is of the same nature as Pyeng Khadoe, of which it is said to be a variety, and the same remarks apply to each of these woods.

39. MAIKAY : MURRAYA, *species.*

Maximum girth 1 cubit. Maximum length 15 feet. Abundant in Tavoy, but scarce near Moulmein. Found in Tavoy and Mergui districts inland. When seasoned, floats in water.

Remarks.—Too scarce for helves, but recommended for handles of planes, chisels, hammers &c. Used by Burmese for handles of knives and other weapons, a strong, tough wood, in grain like Box wood—(Vide Major Simpson's Report). Recommended by the Ordnance Carpenters as the very best wood in the collection for planes or for any purpose in lieu of Box.

40. PTEROCARPUS DALBERGIOIDES, Peddowk or Tenasserim Mahogany.

Maximum girth 6 or even 7 cubits. Maximum length 15 to 30 feet, that of great girth always short. Abundant but scattered. Found all over the Provinces. When seasoned, sinks in water.

Remarks.—A wood already used for gun carriages and for other ordnance purposes, and too well known to require comment. This wood takes about two years to season; when cut it has a peculiar and fragrant smell. The ordinary Peddowk, as used in the Gun Carriage Manufactory, needs no comment, but a wood called Peddowk is procurable in abundance at Tavoy. It seems very strong but does not sink and is devoid of smell.

41. PINATHA. A kind of Jackwood or a Laurus.

Maximum girth 5 cubits. Maximum length 25 feet. Very abundant. Found all over the Provinces particularly in the old deserted Towns. When seasoned, floats in water.

Remarks.—A light wood with a yellow hue which darkens on exposure Useful from the yellow dye which boiling extracts from it and which is permanent in cloth, and not affected even by boiling water. It is used by Phoongees. This wood has a fine tone when struck, and is used for musical instruments by the Burmese, it is used by English brush makers for the backs of hair brushes, being a handsome wood which takes a good polish.

42. TA-KOUK THA (Tavoy), TAY MINE (Burmese).

Maximum girth ½ cubit. Maximum length 7 feet. Abundant. Found all over the provinces. When seasoned, floats in water.

Remarks.—A durable wood, likely to make good helves or to be useful in turning. Too small in size however to be recommended.

43. TIM BOOK THA.

Maximum girth, 1 cubit, maximum length 8 to 9 feet. Scarce. Found in Tavoy and Mergui districts. When seasoned, floats in water.

Remarks.—A very good, tough, light wood; used by Burmese for many purposes, but too small and too scarce to be worth procuring for helves.

44. THEM-MAI-THA.

Maximum girth 2½ cubits : Maximum length 12 feet. Very abundant. Found on both sides of Moulmein River, and on sea coast : in fact all over these Provinces. When seasoned, floats in water.

Remarks.—A wood useless except for firewood, but burns with an intense heat, and is therefore used in preparing salt. Apparently an excellent wood for charcoal for the Arsenal forge or for steamers.

45. VATERIA LANCEOLATA. PAN-THE-YA or Pan-thit-ya.

Maximum girth 6 cubits. Maximum length 60 feet. Very abundant in Tavoy and Mergui, but scarcely procurable in Moulmein. Found in Tavoy and Mergui districts : also along the coast near Amherst. When seasoned, floats in water.

Remarks.—This tree is erroneously called white Thingan, but it is of a totally different order from that of the Thingan. This is said in Remarks by Major (then Captain) Simpson to be still closer, harder and heavier than Thingan (Vide Artillery Records for 1842) Excellent for tool handles, and planes, in short in lieu of Box-wood. Like Sow-Yew, the Chisel-handle tree, it has a peculiar grain apparently of iron running through it. The Burmese use this wood for all purposes for which Thingan is employed, especially in junks. An excellent wood, but with not sufficient spring for helves. Stated by Burmese in Amherst, not to be quite so durable or quite so good as Thingan ; though this is not accordant with Major Simpson's opinion already quoted.

46. KYAITHA OR ITCHWOOD.

Maximum girth 4 cubits. Maximum length 18 feet. Abundant but scattered. Found up the Attaran, Gyne, and Thoungween Rivers near Moulmein and near Tavoy and Mergui. When seasoned, floats in water.

Remarks.—A very compact hard timber, used for posts of houses, zyats, &c. The fibre liable to start with repeated percussion, and the wood itself subject to dry rot, therefore not recommended. This is called Itchwood because the fruit, chips, or bark, produce when touched, an itching like that caused by Cowitge.

47. CHEE NEB OR STINKING WOOD.

Maximum girth 4 cubits. Maximum length 22½ feet. Abundant. Found in Tavoy and Mergui. When seasoned, sinks in water.

Remarks.—The flowers of this wood have an intolerably fetid sickening smell, hence its name ; used by Burmese for boxes, tables &c. a long fibred tough wood when new, but rots so readily that with a whole tree in my possession I cannot cut out a decent specimen.

48. KYET THAY OR TEEAY KYAY. Dimensions and extent of supply not known. Found on sea coast from Amherst to Mergui, when seasoned floats in water.

Remarks.—Used for posts of houses, very durable but not recommended as liable to split.

49. DAGOO THA, meaning Crooked Timber.

Maximum girth 3 cubits. Maximum length 30 feet. Abundant. Found in Tavoy and Mergui. When seasoned floats in water.

Remarks.—Used for building boats, for planks of houses, ladders &c. liable to attacks of worms and dry rot.

50. KANYEEN THA OR WOOD OIL TREE. Named by Mason as Dipterocarpus Lævis.

Maximum girth 6 cubits. Maximum length 70 feet. Very Abundant. Found all over the provinces. When seasoned, floats in water.

Remarks.—Used for rafters and planks, an inferior wood, by no means durable, rots as soon as exposed to water and shrinks readily. Dr. McClelland speaks of this wood most favourably, and states it to be of the Saul family. He must mean some other wood, as this is decidedly a bad wood, very porous, and when kept the oil oozes out and stands in globules over it, it warps to a great extent, and though used for cases does not last for more than about two years. (Vide No. 71. Page 135 of Dr. McClelland's Report, where this tree is classed as Dipterocarpus turbinatus.)

51. KA MEEN THA.

Maximum girth 2 cubits. Maximum length 25 feet. Abundant. Found all along sea coast near Tavoy and Mergui. When seasoned, sinks in water.

Remarks.—Used for posts and planks of houses; very heavy and durable, but too easily split to be recommended.

52. YOUNG THA.

Maximum girth 3 cubits. Maximum length 30 feet. Found in moderate quantities along sea coast near Tavoy and Mergui. When seasoned sinks in water.

Remarks.—Used for posts and planks of houses ; a heavy and durable wood, not bad for planes or handles, though better woods are already specified.

53. NEEN THA.

Very abundant. Found along sea coast near Tavoy and Mergui. When seasoned sinks in water.

Remarks.—Used for rafters of houses ; a very heavy wood, but liable to split, therefore not recommended.

54. PEW BOCK.

Maximum girth 3 cubits. Maximum length 25 feet. Very abundant. Found along sea coast near Tavoy and Mergui. When seasoned, sinks in water.

Remarks.—A strong, tough, durable wood ; recommended for helves.

55. THEE-LA-BAY.

Maximum girth 3 cubits. Maximum length 20 feet. Not very abundant. Obtained from Tavoy, Mergui and Yea. When seasoned, floats in water.

Remarks.—A brittle, useless wood for Ordnance purposes, though employed by Burmese for house posts and to support the shafts of wells.

56. MONG-DAYAT NEE or RED MONG DAYAT.

Maximum girth 2 cubits. Maximum length 15 feet. Not abundant. Found from sea shore Amherst to Mergui and on Callagouk Island. When seasoned, floats in water.

Remarks.—Used for crooks, and straight parts also of ships, and boats: a light tough wood with a good grain, but too liable to rot to be recommended.

57. TO DOORYAN or FOREST DOORYAN.

Maximum girth 3 Cubits. Maximum length 18 feet. Scarce. Found from the sea coast of these provinces and adjacent islands. When seasoned, floats in water.

Remarks.—A soft, light, useless timber, liable to rot readily.

58. BOOK THA.

Maximum girth $1\frac{1}{2}$ to 2 cubits. Maximum length 11 feet. Scarce. Found on the sea coast Amherst to Mergui. When seasoned, floats in water.

Remarks.—Used by Burmese for helves, but rots quickly, and therefore not recommended.

59. TAY YO THA. Grewia.

Maximum girth 2 cubits. Maximum length 18 feet. Very abundant. Found on the sea coast and adjacent islands of these Provinces. When seasoned, floats in water.

Remarks.—Used for oars and masts of boats. When this wood is cut, a very acrid caustic juice or sap flies from it which will destroy sight, if it touch the eye, or if it fall on the face, it raises blisters. A wood dangerous to work, and not durable; not recommended.

60. THAY TO THA.

Maximum girth 5 cubits. Maximum length 25 feet. Very abundant. Found all over Tenasserim and Martaban Provinces. When seasoned, floats in water.

Remarks.—A useless wood; rots very quickly; used for temporary buildings.

61. MANEEOGA, stated by Burmese to be much used for rice pounders.

Maximum girth 4 cubits. Maximum length 30 feet. Abundant. Found all over Tenasserim and Martaban provinces. When seasoned, floats in water.

Remarks.—Not a good wood, as, when stored, it soon dies and rots; the roots are used for medicine; the fruit is eaten by Burmese, and the wood is well spoken of, though favourable specimens have not been seen, by Captain Dance.

62. MAH YAH GAH.

Maximum girth $2\frac{1}{2}$ cubits. Maximum length 18 feet. Abundant. Found all over Tenasserim and Martaban provinces. When seasoned, floats in water.

Remarks.—Used for elephant bells; not a durable wood, and therefore not recommended.

63. THAH BYAY NEE.

Maximum girth 3 cubits. Maximum length 23 feet. Very abundant. Found all over Tenasserim and Martaban provinces. When seasoned, floats in water.

Remarks.—An inferior brittle wood, used by Burmese in short pieces for the props of houses; not recommended.

64. THEE KHYA THA.

Maximum girth, 1 cubit. Maximum length 12 feet. Very abundant. Found all over Tenasserim and Martaban provinces. When seasoned, floats in water.

Remarks.—A very crooked grained perishable wood; not recommended.

65. DOW YAT.

Maximum girth 2 cubits. Maximum length 18 feet. Abundant. Found always inland all over the country. When seasoned, floats in water.

Remarks.—A soft bad wood; useless except for elephant bells.

66. MAY-BYOUNG.

Maximum girth 3 cubits. Maximum length 18 feet. Not abundant. Found near the sea side, and near the mouths of rivers along the coast. When seasoned, sinks in water.

Remarks.—Used for anchors of boats and for the sticks of oil mills; an uncommonly heavy and a durable wood, but not tough enough for ordnance purposes generally, though from its hardness, it makes good planes and turns well.

67. PEE MA PEW or WHITE PEEMA.

Maximum girth 6 cubits. Maximum length 30 feet. Very abundant. Found all over the Tenasserim and Martaban provinces near the red Peema. When seasoned, floats in water.

Remarks.—A tough wood, lighter than Red Peema; does not last for so long a time as Red Peema, and rots in any position when shut up, as in the hulls of ships, in store &c. Not recommended.

68. NA PEW GEE or LET THOUK-GEE.

Maximum girth $1\frac{1}{2}$ cubits. Maximum length 14 feet. Abundant. Found all over the provinces. When seasoned, floats in water.

Remarks.—A useful wood, of inferior grain, and not durable.

69. THA YINGEE.

Maximum girth $\frac{1}{2}$ cubit. Maximum length 6 feet. Abundant. Found all over the provinces. When seasoned, floats in water.

Remarks.—Utterly useless except for firewood.

70. THA NAT THAYT PEW THA.

Maximum girth 2 cubits. Maximum length 15 feet. Very abundant.

PANICUM ITALICUM, L.

TENNEY, TAM. KORA, HIND. CORALOO TEL.

TRANSFER BY P.M.CHATELIER.

J. Dumphy Supt. & Mangr. Govt. Lithc. Press D.P.W.

P. MOORUDOASEN. DELT.

Fort St. George, 12 April 1858.

(True Copy) E. Lawford Major. Supg. Engineer S. Circle. In charge of Central Office P.W.

PLATE, VII.

71. KHA MOUNG THA.

Maximum girth 2 cubits. Maximum length 22 feet. Very abundant.

72. KA THEET THA.

Maximum girth 4 cubits. Maximum length 22 feet ; not very abundant.

73. IN JIN PEWOO, *White Injin.*

Maximum girth 3 cubits. Maximum length 22 feet. Abundant. Found all over the provinces. When seasoned, floats in water.

Remarks.—The above last named four woods very light, perishable, and only fit for firewood. The bark of Ka theet tha used by Karens as betel nut, could probably be useful in tanning.

74. THAH BYAY BEW.

Maximum girth 2 cubits. Maximum length 20 feet. Abundant. Found inland all over the provinces. When seasoned, floats in water.

Remarks.—Not a durable wood.

75. THAY KYA BA.

Maximum girth 3 cubits. Maximum length 24 feet. Very abundant but straggling. Found inland all over the provinces. When seasoned, floats in water.

Remarks.—Used for house posts, but not a durable wood.

76. THAY THA.

Maximum girth 3 cubits. Maximum length 22 feet. Widely scattered. Found inland all over the provinces. When seasoned, floats in water.

Remarks.—A tolerably good and tough wood, but liable to rot in store, and therefore not recommended.

77. THAH BYAY GNET GHEE (means with large leaves.)

Maximum girth 3 cubits. Maximum length 22 feet. Widely scattered. Found inland all over the provinces. When seasoned, floats in water.

Remarks.—A tolerably good and tough wood, spoken of by Dr. McClelland as a strong and close grained timber.

78. THA PYKE THA.

Maximum girth 5 cubits. Maximum length 30 feet. Very abundant. Found along the banks of rivers, all over the provinces. When seasoned, floats in water.

Remarks.—A wood of no durability : not recommended.

79. KYAI YEW.

Maximum girth 3 cubits. Maximum length 22 feet. Rather scarce. Found all along the banks of rivers, all over the provinces. When seasoned, floats in water.

Remarks.—Used by Burmese to make charcoal, also sometimes for posts of small huts : too brittle to be recommended.

80. TOUNG BYE NAY.

Maximum girth 5 cubits. Maximum length, 30 feet. *Scarce.* Found along the banks of rivers all over the provinces. When seasoned, floats in water.

Remarks.—A brittle short grained wood. Not the mountain jack, though similar to it in name.

81. MAY SHOUNG.

Maximum girth $2\frac{1}{2}$ cubits. Maximum length 18 feet. Scarce. Found on sea coast, Amherst to Mergui. When seasoned, floats in water.

Remarks.—A short fibred, brittle, yet soft wood, not durable ; called, but erroneously, a kind of Annan by the Burmese. Not a durable wood, and besides too scarce for ordnance purposes.

82. THA BATE KEE.

Maximum girth 3 cubits. Maximum length 18 feet. Scarce. Found all over the Provinces near the sea and at the mouths of rivers. When seasoned, floats in water.

Remarks.—A short fibred, brittle, yet soft wood, not durable.

83. MONG-DAYAT PEW OR WHITE MONG DAYAT.

Maximum girth $2\frac{1}{2}$ cubits. Maximum length 22 feet. Scarce. Found all over the provinces near the sea and in the mouths of the rivers. When seasoned, floats in water.

Remarks.—Not a good wood, being very perishable.

84. KAB-BAN-THA.

Maximum girth 6 cubits. Maximum length 30 feet. Scarce. Found inland in Amherst and Tavoy Provinces. When seasoned, floats in water.

Remarks.—Makes beautiful furniture, and when long buried in ferruginous mud, turns of a *very dark* red. Found to make excellent planes ; used in Tavoy jail with great success, for all tool handles, and much recommended for such as do not receive direct percussion, as screw drivers, augers, hammers, handles ; in fact for all tools except chisel handles, which are to be struck with a hammer, for which the Chisel-handle tree, " Dalbergia," *Species*, is the best ; makes excellent planes ; stated by Dr. McClelland to be most plentiful in Tharawaddy district, and to be hard, of fine grain and used in constructing carts. The writer has seen a quantity of this lately sold (in August 1857) for export to Holland as a furniture wood.

85. KYEE THA named by Mason as *Syndesmus Tavoyana* and also called *Kyay Mishoung* named by Dr. McClelland as *Barringtonia acutangula.*

Maximum girth $2\frac{1}{2}$ to perhaps 3 cubits. Maximum length 10 or 12 feet. Very scarce in Moulmein, but sufficiently abundant at Tavoy. When seasoned, sinks in water.

Remarks.—Same as kab-ban-tha.

86. KHA BONG PEW.

Maximum girth 2 cubits. Maximum length 15 feet. Abundant. Found on the sea coast, Amherst to Mergui. When seasoned, floats in water.

Remarks.—Liable to attacks from worms, rots readily, a brittle inferior wood.

87. KOUNG MOO.

Maximum girth 5 cubits. Maximum length 30 feet. Scarce. Found near Moulmein, also near Tavoy and Mergui on the sea coast and on the banks of rivers. When seasoned, floats in water.

Remarks.—Not a good wood, but perishable and liable to rot readily.

88. NA YOOAY.

Maximum girth 3 cubits. Maximum length 22 feet. Scarce. Found all over the provinces. When seasoned, floats in water.

Remarks.—A durable tolerable good wood with a curled grain, used by Burmese for oars, much like English oak in appearance, but deficient in tenacity. Not recommended, being scarce, while equally good woods are abundant.

89. KHAI YAH.

Maximum girth $2\frac{1}{2}$ cubits. Maximum length 22 feet. Scarce. Found all over the Provinces. When seasoned, floats in water.

Remarks.—A tolerably good wood but not recommended, because like the "Na-yoo-ay" it is too scarce.

90. DALBERGIA LATIFOLIA; YENDAIK; BLACK WOOD.

Maximum girth 2 cubits. Maximum length 10 or 12 feet. Abundant in Tavoy and Mergui, elsewhere scarce. Found all over the provinces, but mostly in Tavoy and Mergui. When seasoned, sinks in water.

Remarks.—This, unlike the Black wood of India, has a fetid smell like that of new Corduroy and a white grain interspersed amongst the black and red. It is not so handsome a wood as Indian black wood, but is far tougher, is not brittle, excellent for spoke shaves, for handles of screw drivers, augers, gimblets. Used by the Chinese carpenters for planes, and is excellent for that purpose though heavy; but they use smaller planes than we do. Like others of the hardest woods of Burmah, it is so full of natural cracks, that two feet of timber are wasted for one foot made up after being sawn; but when made up, this wood cracks no more and resists sun or rain admirably. The "Tai" is not Yendaik but Ebony, and is brittle and devoid of smell.

91. PHYOO.

Maximum girth $1\frac{1}{2}$ cubits. Maximum length 17 feet. Abundant. Found in Tavoy and Mergui, also in less abundance in Amherst Province. When seasoned, floats in water.

Remarks.—A tolerably good strong wood, but not with much tenacity of fibre.

92. TYE YOO THA OR LAM THAH.

Maximum girth 2 cubits. Maximum length 22 feet. Scarce. Found in Tavoy and Mergui, also in less abundance in Amherst province. When seasoned, floats in water.

Remarks.—A bad brittle wood; readily splits and warps.

93. PHET HONWAY.

Maximum girth 3 cubits. Maximum length 22 feet. Scarce. Found at Tavoy and Mergui. When seasoned, floats in water.

Remarks.—A short grained, brittle wood, splits and rots readily.

94. OUK GUAY.

Maximum girth $1\frac{1}{2}$ cubits. Maximum length 15 feet. Scarce. Found all over the provinces. When seasoned, floats in water.

Remarks.—The root of this tree is used as a medicine by Burmese, the wood perishable, and grain short.

95. NGY-SOUNG THA.

Maximum girth $3\frac{1}{2}$ cubits. Maximum length 22 feet. Abundant. Found all over the provinces. When seasoned, floats in water.

Remarks.—A wood of no durability or strength; splits readily, with a short grain. Only fit for fire-wood.

$95\frac{1}{8}$. NA GHEE.

Maximum girth 3 cubits. Maximum length 15 feet. Abundant. Found all over the provinces. When seasoned floats in water.

Remarks.—A tolerably good wood, used for mallets, but not durable enough to be recommended.

$95\frac{2}{8}$. TAYET KHYEE.

Maximum girth 2 cubits. Maximum length 15 feet. Abundant. Found all over the provinces. When seasoned, floats in water.

Remarks.—A pretty wood in grain, but one which rots when it dies: of no durability.

$95\frac{3}{8}$. MURRH NEEN.

Maximum girth 2 cubits. Maximum length 15 feet. Abundant. Found all over the provinces on low grounds. When seasoned floats in water.

Remarks.—A petty wood, looks exactly like deal, but stated to have no durability.

Additional List of Woods, by Capt. Dance, Dep. Commissary of Ordnance, T. P. 28th July 1856.

96. YEMMANEE. Tree not known but Karens say it bears a yellow flower and small plum which is the favorite fruit of the barking deer. Vide Mason's Tenasserim, page 213.

Maximum girth 4 cubits. Maximum length 20 to 30 feet. Very abundant. Found inland near the banks of the Gyne and Attaran rivers and at the back of the mountains near Moulmein. When seasoned, floats in water.

Remarks.—Very durable ; used by the king of Ava for his carved furniture, also by Burmese for boats ; a slightly scented wood, the lightest in the collectiou ; free from cracks. Excellent for fuzes and appears quite free from acid or from tendency to rot.

97. SOWAY DO.

Maximum girth $1\frac{1}{2}$ cubits. Maximum length 10 or 12 feet. Very abundant. Found on sea coast and on the banks of rivers in these provinces. When seasoned, floats in water.

Remarks.—A wood much recommended for gun stocks with but one fault ; that it is crooked and therefore not more than ten or twelve feet can be procured between the bends. This wood is commonly sold to Burmese for half a rupee a piece, large enough to make one gun stock.

98. THAYET KYA.

Maximum girth 2 cubits. Maximum length 20 feet. Not very abundant, but occasionally procurable Found inland near the back of hills near Moulmein, and here and there all over the provinces. When seasoned, floats in water.

Remarks.—Durable and light, a good wood for helves if indented for with other woods for the same purposes.

99. CHIN ZOOAY. Meaning Elephants-teeth.

Maximum girth $1\frac{1}{2}$ to 2 cubits. Maximum length 10 feet. Abundant in the hills. Found inland, always on rocky barren hard ground in mountainous or hill districts all over the provinces. When seasoned, sinks in water.

Remarks.—This wood is believed by the writer to be the hardest and strongest known in these latitudes, perhaps any where in the world. It is however only procurable in such rocky spots as no other tree will grow in, so must be sent for on purpose. It cuts up as does yendaik and other hard woods do with huge cracks through it ; in fact this is the most wasteful of all known valuable timber in this respect and the original scantling is but small, so that it is not recommended for general purposes, but it is invaluable for the edges of Phillester Planes for spoke shaves and for such purposes in which much scantling is not required.

100. THAN THAT.

Maximum girth 2 to 3 cubits. Maximum length 12 feet. Very difficult to procure. Found inland up the Gyne and Attaran Rivers. When seasoned, floats in water.

Remarks.—Very durable ; used by Karens for bows, for shoulder yokes, spear handles and many other purposes. Excellent for hammer handles from its tough fibre.

101. YEEN GA.

Maximum girth 2 cubits. Maximum length 15 feet. Not very abundant. Found in Moulmein itself, and scattered over the provinces. When seasoned, sinks in water.

Remarks.—Stated to be good for helves, not so strong as Chisel handle tree but possessing its properties in an inferior degree ; and good for helves. Rupees 45 per 50 feet by 1 foot square. Used by Burmese for helves, for mamotties, and is a very pretty white wood for furniture.

102. MOKETAMMATHA. Meaning Martaban wood.

Maximum girth 1 cubit. Maximum length 8 feet. Very abundant. Found in Martaban and its adjacent jungles, also all over the provinces especially on the banks of rivers. When seasoned, sinks in water : uncommonly heavy.

Remarks.—Stated to be used for the same purposes as Chisel handle tree, but still stronger.

103. GYEW.

Maximum girth 2 cubits. Maximum length 15 feet. Abundant. Found in the jungle round Moulmein and all over the provinces. When seasoned, floats in water.

Remarks.—Stated by Burmese to be equal to chisel handle tree, Dalbergia, species, but if so the writer has not yet seen a favourable specimen.

104. PINLAY JALLAT.

Maximum girth $2\frac{1}{2}$ to 3 cubits. Maximum length 15 feet. Tolerably plentiful. Found by the sea side and very near to water's edge, in these provinces. When seasoned, floats in water.

Remarks.—A wood strongly recommended for fuzes, free from oil, and acid, light, yet strong ; it is much used for rockets of enormous dimensions and for wooden guns, used for the burning of the dead Phoongees and on other occasions.

105. BEE-EW. Not identical with *Thee Bew Tha.*

Maximum girth 3 cubits. Maximum length 22 feet. Trees very abundant. Found near the sea or the rivers edge, all over the provinces. When seasoued, sinks in water.

Remarks.—A very hard, strong wood ; used in rice mills where great strength and wearing well are indispensably requisite : recommended for handles of tools.

106. KUSSOO, not identical with Kye-zai.

Maximum girth 2 cubits. Maximum length 15 feet. Abundant. Found near the sea or the rivers edge, all over the province. When seasoned, sinks in water.

Remarks.—A very tough wood, durable, and as good as Kyezai, for helves. The Kyezai is a wood of the colour of oak with a yellowish tinge. The Kussoo is nearly white. This is not the soondree wood, of which latter the Burmese name is nearly the same, and the soondree wood Captain Dance failed to procure hitherto.

107. KYAI THA.

Maximum girth 1½ to 2 cubits. Maximum length 7 feet. Scarce. Found on low marshy grounds in these provinces, but widely scattered. When seasoned, sinks in water.

Remarks.—Excellent for planes, or for any other purpose, for which a straight grain, great toughness and strength are required.

108. PHANGAH.

Maximum girth 4 cubits. Maximum length 20 feet. Very abundant. Found in jungles near Moulmein and all over the provinces. When seasoned, sinks in water.

Remarks.—Used by Burmese for poles of carts and by the poorer class for houses; very strong and likely to make good planes, handles, or helves.

109. TUNYEEN OR TUNYEEN DHA.

Maximum girth 5 cubits. Maximum length 30 or 40 feet. To be procured in moderate quantities. Found scarce near Moulmein and Sittang rivers, more abundant near Tavoy and Mergui. When seasoned, floats in water.

Remarks.—Used for construction of those very large boats which go from Moulmein to Tonghoo; hence in such demand here, but not so much so on the sea coast. A wood which when cut, has a peculiar and fragrant smell, is tough and oily and likely to make excellent planes, handles &c. &c.

110. EBONY. DIOSPYROS, TAI.

Maximum girth ½ to 1 cubit. Maximum length 8 feet Very scarce. Found from the forests in the direction of Shuay Gheen. When seasoned, sinks in water.

Remarks.—This wood, much sought for by Captain Dance could not be procured in Moulmein in sufficient abundance for it to be suitable for any ordnance purpose.

Concluding Remarks, dated Moulmein 30th September 1857. From all enquiries, it appears that the prices of all the useful woods specified in the above List are about the same, viz: Rupees 45 per ton. This List is in substitution of that before forwarded with letter No 305 dated 1st May 1856 from Captain Dance to the Military Board; which latter was requested to be cancelled. The three headings of woods for helves, woods too heavy but useful for other purposes, and useless woods, have been retained as first classed, though some of the first class have been found useless, some of the second good for helves, and some of the third (as yendaik) valuable; but fresh numbering would cause confusion, and opposite to each wood is specified, whether it be useful, and if so for what purpose.

SECTION VII.

ANIMAL SUBSTANCES.

SUB JURY.

The Hon'ble W. ELLIOT, Esq.

Lieut. MITCHELL, *Reporter.*

This although not an extensive subdivision contains some articles of considerable importance both to the home manufactures and to the exporter.

BEESWAX.

Samples of this useful product have been received from several localities. Some do not appear to have been subjected to any cleansing process, others are very impure. A few specimens have been very carefully prepared; of these the Jury would particularize a sample from the Madras Local Committee, and another from Guntoor. Armoor has exhibited a cake of black wax.

BLISTERING BEETLES.

Specimens of that useful substitute for Cantharides, the Mylabris, have been exhibited by Apothecary Huffton of Salem, and by M. A. Collas, Marine Surgeon of Pondicherry, who has sent two species, viz, M. pustulata and M. punctulata.

This Beetle abounds in the neighbourhood of Bangalore and may be obtained in large quantities at the end of the year. At Madras also we have found two well defined species and several varieties besides those exhibited. It is therefore probably to be found in most parts of Southern India.

GLUE.

Only two samples have been exhibited, neither of which is good, No. 477 from Paulghaut is the best, its fractured edge is clear and vitreous, but it is soft and dark coloured. The other is black and opaque.

HONEY.

Of honey several samples are exhibited, none however have been put up with the care necessary to procure a good market. High prices are paid for imported Honey simply because the large produce of the country is not gathered with sufficient care.

The Jury is not acquainted with the means adopted to prevent the fermentation of Honey. Most of the samples exhibited have undergone the fermentative process, and information of the precautions

taken in Europe to prevent this would be very acceptable.

It would also be desirable on future occasions that the name of the species of Bee and the plants on which it feeds should accompany the Honey. But if this cannot be done, specimens of the Bees and of the plants may be forwarded instead. The Honey exhibited differs much in colour and odour and although this may be in some measure dependent upon the age of the Bee, it is much more so upon the nature of their food.

HOG'S BRISTLES.

Kurnool and Wynaud have exhibited small quantities of Hog's bristles very well suited for making Brushes. This article would find a ready sale in the European market. The Hog being considered an impure animal by most of the Natives of India there is but very little consumption of Bristles in the country. The quantity used in Great Britain is so large that in 1841, 1,735,562 ℔. were imported, and the imports have probably much increased since then.

Horns, Nails, Tusks &c. Under this head are exhibited some Deer and Bison's horns, a few Boar's tusks and some Tiger's claws; also a few of the (so called) shells of the Land Tortoise, but there is nothing calling for particular remark.

WOOL.

The most valuable article in this Section is undoubtedly Wool, but the specimens of Native Wool are but few and generally of an inferior quality.

The Madras Chamber of Commerce exhibited samples of wool from all quarters of the globe with the London market prices affixed. These form a useful and instructive series and have greatly assisted the Jury in deciding upon the merits of country grown wool.

The Government sheep farm in Mysore exhibited 7 Samples consisting of the wool of the pure imported, and of the Farm-bred Merino crossed with the country sheep and one specimen from the common sheep of the Province.

The last named appears to be the kind used for making the Mysore white cumbly and is of a coarse description. The $\frac{1}{4}$ bred Merino has produced a finer fleece than the $\frac{1}{2}$ bred, which is an anomaly. The wools of the $\frac{3}{4}$th and $\frac{7}{8}$ths bred are good, the last being the finest and most uniform in size.

The Farm bred and imported Merino have about the same diameter of fibre, but the latter is only about half the length of the former.

The Jury would have recommended a 2nd Class Medal for the samples had they belonged to a private exhibitor, but as they do not conceive it to be the object of the exhibition to reward a public establishment, specially devoted to improving the breed of sheep they award the "Honourable mention" which it undoubtedly merits.

The Farm wools excepted, the Jury considers the best specimen of country grown wool from the Merino, is No. 814, exhibited by Mr. Fitzgerald of Chingleput, and recommend a second class Medal for this sample. It is not stated whether this wool was taken from a pure Merino or a cross, but it is soft and elastic, and has the true Merino curl.

Armoogum Moodelliar of Chingleput has exhibited two specimens of Merino. No. 5309 is moderately fine and soft but is deficient of the wavy curl so characteristic of the true Merino wool.

No. 1949 from Bellary is perhaps a fair specimen of country-wool; it is not so fine as No. 4092 and 6852 exhibited by Messrs Fischer and Co. of Salem, but the fibre is more uniform in size.

In conclusion the Jury would add that all the wools exhibited which are the growth of the Native sheep are deficient in fineness and curl. They are either altogether straight or at the best have a scarcely imperceptible waviness. Great care however appears to have been taken in cleansing them, a matter of importance both to grower and exporter, for a well washed wool realises about double the price of unwashed. Moreover it should be remembered that when wools are intended for export, the dirt nearly doubles the cost of carriage and freight.

SILK.

Among the Miscellaneous Animal products may be noticed the Silk worm cocoons from Pondicherry although more properly belonging to Class XIII in which their economical value and uses have probably received full consideration; but they were also brought under the notice of this Sub Jury as Raw products in the classified catalogue furnished to them by Lieutenant Hawkes.

Of these the Jury were particularly struck with the beauty of the Pondicherry Cocoons, and more especially with those of the deep yellow Milanese and the white and yellow Trivoltine kinds. All the Pondicherry Cocoons presented the peculiarity of being constricted in the middle while those from other places were of the ordinary oval form, as for instance those from Salem, also of good though inferior quality.

M. Perottet had raised as many as ten successive generations, from the same stock, in his manufactory, during the year, but the process of breeding seems to require much care and management.

It has occurred to the Jury that the observations made by M. Dumas on the mulberry plantations of France in the early part of the present year might be studied with advantage in India.

That Gentleman having been deputed by the French Government to enquire into the cause of the mortality among the silk-worms during the pre-

ceding season, has ascertained, that mountainous regions are the places best adopted for breeding the silk-worm and that those only which are produced on elevated localities had succeeded during the prevalence of the Epizoic, whilst those bred in low grounds had as generally failed.

These facts indicate the propriety of trying to breed the worm on some of the many ranges of Hills in Southern India, as the Shirvaray, Santamangalam, Yelagherry, Nallamalla, Jiwadi, and other groups.

It is true that some of these are unhealthy, but persons engaged in superintending the breeding process might avoid the danger of fever by sleeping at the foot of the Hills and by availing themselves of the services of the Hill people.

We know already that the culture of silk has long been prosecuted in Mysore, but even there it may be worth while to examine whether any difference is found between the results obtained at different degrees of elevation on the plateau of the Table-land.

Several specimens of Cocoons, the produce of *Saturnia Paphia* which yields the Tusseh silk of Southern India, were exhibited from Pondicherry and elsewhere but in small quantities only.

From Pondicherry also came the Cocoons of *Actias selene* the larva of which feeds on the Odina Wodier. M. Perottet has the credit of having first turned the silk of this species to useful account, having exhibited a pair of gloves manufactured from it.

Capt. Benson of the Commissariat exhibited Cocoons of the large Burmese *Saturnia*, believed to be *S. Atlas*, from which the tusseh of China is procured.

The collections of peltry were considerable, but included nothing rare or new or otherwise interesting.

That transmitted by the Rajah of Vizianagaram comprehended skins of most of the ordinary Indian Wild Animals.

Of stuffed Animals, good specimens were exhibited of the comparatively rare *Felis Bennettii* and *Viverra Zibetha* from Travancore.

A large and well prepared series of bird skins was exhibited by Dr. Day from Hyderabad, comprising most of the ordinary species but none of marked rarity.

A good set of bird skins was also sent from the Malabar Coast.

Mr. Walter Elliot sent a large and varied series of Crania including all the best known and many of the rarer species of Indian, with several of African and Malayan Mammalia. A full list being given in the Catalogue raisonní it is unnecessary to refer to them further.

A few remarkable animal products were observed among the drugs in Class II.

In Dr. Smith's collection from Hyderabad was a white granular concrete substance under the name of Shakar ul Ashar or Sugar of Ashar;* which on closer examination proved to be the covering of the pupa state of a species of beetle belonging to the group of *Curculionidœ*, the larva of which had evidently punctured the bark of the plant on which it occurs to obtain a covering.

Dr. Jesudesan exhibits a Lizard said to come from Arabia under the name of *Ragumai* or *Rakoomoy*, portions of which were also found in the Kurnool collection labelled *Reg Kami* and said to possess tonic and aphrodisiac qualities. It belongs to the *Scincoid* group, but seems to differ from the *Scincus officinalis* and from the *Euprepes physicæ* both of which are used medicinally in Western Africa, and the former of which had once a European reputation.

A few other articles are only noticed as illustrations of the empirical nature of native medical science such are :

Hare droppings, *Musalpulukhi*.
Breast bone of a capon—no name.
Shell of the water tortoise (*Emys*) *àmai ódu*.
Tiger's fat.
Peacock's fat.
The stomach of the porcupine. *Mulu handi maw*.

J. MITCHELL,
Reporter.

WALTER ELLIOT,
Chairman Class IV.

عشر * In Meninski is explained to be "a species of spinous gum-bearing tree, the fruit of which is an inflated tubercle, also bearing the same name, which is white and sweet like sugar, whence شكرالعشر which some will have to be red sugar and which like dew is wont to fall upon this tree."

Men..Thes. Voce. عشر

Exhibition Number.	Name of Exhibitor, &c.		Description of Wool.	Maximum and Minimum diameter of each sample in fractions of an inch.	Microscopic appearance and peculiar properties.
1949	Local Committee	Bellary,	Merino	$\frac{1}{812}$ to $\frac{1}{270}$	Fibre coarsely imbricated and straight. Wool harsh to the feel.
1950	Nagojee	Bellary,	Country Sheep	$\frac{1}{1625}$ to $\frac{1}{650}$	Imbrications slighter, very slightly curled, fibre short and unelastic.
813	Mr. Fitzgerald	Chingleput,	Merino	$\frac{1}{1300}$ to $\frac{1}{325}$	Coarsely imbricated, very little curl or elasticity, fibre short and weak.
814	„	„	„	$\frac{1}{1625}$ to $\frac{1}{812}$	Imbrication moderate, soft, curly and elastic.
5308	Armoogum Mood.	„	„ Ashcolour	$\frac{1}{1083}$ to $\frac{1}{361}$	Coarsely imbricated, very little curl or elasticity, fibre short and opaque.
5309	„	„	„ Yellow	$\frac{1}{1625}$ to $\frac{1}{722}$	Imbrication moderate, soft, and elastic but deficient in curl.
4091	Messrs Fischer & Co.	Salem.	Not stated	$\frac{1}{1300}$ to $\frac{1}{433}$	Coarsely imbricated, scarcely any curl or elasticity, wanting in softness.
4092	„	„	„ „	$\frac{1}{1300}$ to $\frac{1}{323}$	As last, but the fibre rather more waved and elastic.
689	S. Berar	Talook.	„ „	$\frac{1}{590}$ to $\frac{1}{270}$	Very short and coarse.
690	Wurungole	Talook.	„ „	$\frac{1}{1300}$ to $\frac{1}{232}$	Coarsely imbricated, fibre short and opaque.
691	Nulgoondah	„	„ „ White	$\frac{1}{1300}$ to $\frac{1}{433}$	Coarsely imbricated, very little curl or elasticity, short, opaque and harsh.
691	„	„	„ „ Black	$\frac{1}{1625}$ to $\frac{1}{296}$	As the last, but longer staple.
„	Mysore Farm Balasoor and	Nursapoor.	Common country sheep	$\frac{1}{1300}$ to $\frac{1}{152}$	Coarsely imbricated, fibre slightly wavy, $2\frac{1}{2}$ to 1 inch long.
„	„ „	„	$\frac{1}{4}$ bred merino	$\frac{1}{1300}$ to $\frac{1}{542}$	Imbrications moderate, moderately soft, slightly curled and elastic.
„	„ „	„	$\frac{1}{2}$ „ „	$\frac{1}{1083}$ to $\frac{1}{310}$	A very inferior wool to the last, short, harsh and mixed with hair.
„	„ „	Hurgumbully	$\frac{3}{4}$ „ „	$\frac{1}{1300}$ to $\frac{1}{542}$	Coarsely imbricated, curly and elastic of a medium length and softness.
„	„ „	„	$\frac{7}{8}$ „ „	$\frac{1}{1625}$ to $\frac{1}{812}$	Imbrications moderate, well curled and elastic, about 4 in. long, soft.
„	„ „	„	Farm bred merino	$\frac{1}{1625}$ to $\frac{1}{1086}$	Imbrications delicate, well curled and elastic, soft and long, 4 to 5 in.
„	„ „	„	Pure imported „	$\frac{1}{1625}$ to $\frac{1}{922}$	Resembles the last, but the fibres have only about $\frac{1}{2}$ the length.
5899	Chamber of Commerce		German fine	$\frac{1}{2166}$ to $\frac{1}{1300}$	Imbrications delicate, fine, many curls, being elastic and very soft; fibre contracts from 3 to 1 inch.
5891	„ „		Sydney clothing, fine	$\frac{1}{1300}$ to $\frac{1}{812}$	Imbrications conspicuous, well curled and elastic, soft, fibre short.
5910	„ „		Buenos Ayres scoured	$\frac{1}{1300}$ to $\frac{1}{928}$	Imbrications conspicuous, but moderately curled or elastic, soft, fibre longer.
5916	„ „		East Indian brown	$\frac{1}{1444}$ to $\frac{1}{520}$	Imbrications conspicuous, but little curl or elasticity, length moderate.

CLASS V.

REPORT OF THE JURY ON MACHINES FOR DIRECT USE, INCLUDING CARRIAGES IN RAILWAY AND NAVAL MECHANISM.

Jury.

Lieutenant Colonel T. T. Pears. C. B., *Chairman.*
Major Maitland.
Major Jenkins.
Lieutenant Colonel F. C. Cotton.
R. Kennedy, Esq.
W. B. Wright, Esq.
Major Jacob.
J. J. Franklin, Esq.
Captain Biden.
Major Worster, *Reporter.*

The most interesting feature in this group, is the application of Water power as a motor of Punkahs.

It has long been a speculative question to find a substitute for manual labor which should be both economical and efficient in its action, but almost every scheme has proved abortive, either from neglect of first principles of mechanics, or of their right application.

In the designs now exhibited, of connecting a Punkah with an over shot water wheel, the question is at once simply and effectively resolved, and wherever the requisite supply of water can be raised within a moderate time, and at small cost, the plan recommends itself to general attention.

No. I. A self acting Punkah by R. Kennedy, Esq.

Motion is given to this Punkah by the alternate discharge of water from a reservoir into (two) curved arms attached to a compound Pendulum, the speed of which can be regulated within certain limits, by altering the position of a weight below.

The discharge is near the centre, and it will readily be understood that by permitting the flow of water into one arm, a proponderance will be given to that arm; and if at the limit of oscillation, the water is allowed to escape, the return of the Pendulum will bring the opposite arm under the influence of the discharge pipe, and thus motion will be kept up, to give a reciprocating movement to the Punkah attached to it.

The principle is analogous to Perrault's pump or "Hydraulic Pendulum."

No. II. The same by continuous motion by W. B. Wright, Esq.

The prime mover in this design is an overshot water wheel ; increased velocity being given to the Punkah by the intervention of band wheels.

To the smaller of these wheels is attached a slotted arm, and a connecting rod with an adjustable pin clamped in the slot, acts on a bent or rocking lever, the longer arm of which, gives motion to the Punkah through an interposed flat spring bar fastened a little above the points of suspension, to prevent any sudden jerk or strain on the machinery.

The velocity of the Punkah compared to that of the wheel is in the ratio of 5 to 1 ?

The Inventor states that about 8 gallons of water are sufficient to keep the wheel in action for 8 hours.

In a second design, Mr. Wright has much simplified the movement, by attaching a lever jointed below, to the frame of the water wheel. The central part of the lever being slotted, to receive a crank pin, the crank forming part of the axle of the wheel. In its revolution therefore, a reciprocating motion is given to the lever, and consequently to the Punkah, which is connected with it, by a rod at the upper extremity; there is thus a double oscillation for every revolution of the water wheel.

No. III. A self acting Punkah by Mr. Orr.

In principle this is similar to the preceding, but it is but just to state that although priority of application is due to Mr. Wright, Mr. Orr must be considered in the light of an independent inventor so to speak of this mode of applying power through the agency of a water wheel.

In communicating motion to the Punkah, Mr. Orr has no intermediate gear beyond a simple crank, connected by a rod to an arm attached to a long "rocking shaft" to which the Punkah is rigidly fixed by wooden bars.

The length of the swing is proportionate to the angular movement of the lever, and its attached shaft, and a double oscillation is obtained by every revolution of the wheel. One hundred gallons of water are required to drive the wheel for 2 hours.

Mr. Orr has practically carried out this plan in his own premises with every success ; where a wheel of 12 feet diameter gives motion to 5 Punkahs each of 14 square feet area, at an expenditure of 2640 gallons of water per working day of 8 hours. With a good pump one man could easily raise this quantity of water in less than two hours.

No. IV. Machines from the foundry at Dowlaishwarum.

The contributions from the Dowlaishwarum works are sound and creditable specimens of workmanship, and consist of a crane, a single and double crab ; the castings being left nearly in the state as they came from the hands of the Founder.

No. V. Weighing Machine by J. J. Cotton Esq.

This Machine is similar to the ordinary weighing platforms, but constructed of wood instead of Iron. A full description is inserted in the body of the general catalogue.

No. VI. The Railway Locomotive Department at Madras, under the superintendence of Mr. Wright, contributes a fire Engine, the model of a Railway Carriage, and Mechanism generally of Locomotive Engines.

In construction and finish, the fire Engine must be considered equal, if not superior, to similar productions of English manufacture. The model of a Railway Carriage on a scale of 2 Inches to the foot, is beautifully executed by Natives under the supervision of Mr. Legget. The Railway Mechanism is principally of English manufacture, but the specimens from the Superintendent's work shop will bear most favourable comparison with all, or any portion of it.

The traversing and lifting, as well as the simple lifting jack, are ingenious adaptations of well known means of giving power and adjustment, in raising carriages and heavy weights &c.

Mr. W. G. Maddox, Superintendent of Machinery at the Mint, exhibits an assorting Machine, invented by Colonel Smith of the Madras Engineers. A descriptive paper by the Exhibitor, accompanies this highly interesting machine, which gives the following account of the apparatus, its purpose, and mode of working.

MADRAS MINT.

ASSORTING MACHINE.

FOR

Double Anna Pieces.

INVENTED BY COLONEL SMITH OF THE MADRAS ENGINEERS.

In the Madras Mint, where only two Laminating Mills are used, the following mode of obtaining accuracy in the weight of the coins, has been resorted to with great success.

After the straps of silver have passed through the second Mill, the disks are punched from them, rather larger than are required for coinage. These disks, are then assorted by the self adjusting Machine, and each is placed under a second circular punch or "cutter," of such a size as will remove a ring of metal from the circumference, and render it as nearly as possible, the true weight. By this process, the adjustment of the coin, by filing, is entirely avoided; and the blanks, or pieces prepared for stamping, are more economically obtained, than they are in other Mints, by a more lengthened process of lamination, and correction with the file.

The beams of the assorting machine, are made of close grained Fir; the lightest procurable. The arms are four times as long on one side of the fulcrum, as they are on the other. The points of suspension, are what are termed "knife edges," and they are fixed in the centre of gravity, in order that the beam may be freely suspended. A rod of fine silver, with a "retarding plate," of the same metal at the lower end of it, is suspended from the short arm of the beam, and immersed in distilled water, to check the vibration of the beam, and bring it to a state of rest; while the rod, which is a counterpoise to the disk, being more or less immersed, according to the weight of the piece, acts as the Hydrometer, and by its height out of water, at once determines the exact weight of the disk, and gives it a position according to that weight. Near the loaded end of the beams are twelve openings, which communicate with twelve divisions in a drawer below, so that all the disks of equal weight, remain suspended when the beams come to rest, opposite to one entrance. The spaces between each of these openings, are one inch broad, and the loaded arms of the beams, are four times the length of the other arms ; a movement of the rod $\frac{1}{4}$ of an inch represents a change of weight of $\frac{1}{8}$ of a grain, and to that minute quantity the disks are assorted.

To bring the machine into use, a normal disk is found by means of the simple Lever-balance. This piece is placed upon one of the beams, and the water level in the cups, in which the rods and plates are suspended, is so adjusted, that the disk takes its position opposite to the centre opening. When this is the case, the whole of the arms are in the same adjustment. The Hoppers are then filled with disks, and by the motion of a one hand lever, a disk is thrust from each Hopper to the beam opposite to it ; another movement leaves the beams free, and they take up their positions according to the weights of the disks, each in front of some one of the twelve openings. In less than 20 seconds all are at rest, when by a rapid movement of one of the hand levers the whole of the disks are thrown into their respec-

tive openings and the beams rise to the level of the Hoppers to receive a fresh load.

By this beautiful apparatus, one man, with a boy to fill the Hoppers, is able to assort to the great minuteness of $\frac{1}{8}$ of a grain, no less than 60,000 disks in the day.

(Signed) W. G. MADDOX.

This machine was exhibited in London at the great Exhibition of 1851 where its delicacy of adjustment, and practical efficiency, were fully appreciated, and earned for its inventor a class medal. Had this reward not been already received, the Jury would have considered it their duty to recommend that a medal should now be awarded, as they consider that the machine stands unrivalled amongst the mechanical inventions of this Presidency.

Mr. Smith the Superintendent of the Government Printing Establishment, exhibits two American Presses imported and brought into use by him.

One of these Presses is a most complicated but beautifully arranged piece of mechanism, occupying a space of only 8 square feet, worked by one boy, and capable of throwing off 22,000 copies in a working day of 7 hours.

The other Press is in character the reverse of this, being remarkable for its extreme simplicity. The whole machine consists of a heavy iron cylinder with flanges, rolling upon rails just so high that the Galley containing the type can receive the weight of the cylinder as it rolls over it. In Printing the paper is laid on the type, and the roller is passed along the rails ; the sheet is then removed, the type inked, another sheet placed, and as the roller is returned, a second copy is obtained.

This description of Press is called from the use to which it was originally applied "a Proof Press," as it was only employed as an aid to the larger Presses for printing proof sheets. Its use however has already greatly extended, and in this country it will probably do more for printing than the most perfect machines, since it will be readily made where the arts are in a rude state, and no part of India need be without its Press. It is not necessary that the cylinder should be of Iron which is difficult to cast and turn ; brass or even wood loaded with lead would answer every purpose, and Presses of one or the other of these materials could be made any where.

Mr. Smith has rendered the country a most important service by the importation of these Presses, and it must be admitted, that by his introduction of machinery and the admirable organization of the establishment under his charge, he has made a most important advance in the progress of printing in Madras.

The jury consider that although there is no original invention exhibited by Mr. Smith that his name deserves to be honorably mentioned.

JURY AWARDS.

2D CLASS MEDAL.

Number.	Number.	NAME.	Object rewarded.
		M. Orr.	Self acting punkah.
		F. L. Moncrieff, Esq.	Crane and Crabs &c.

HONORABLE MENTION.

Number.	Number.	NAME.	Object rewarded.
		W. B. Wright, Esq.	Self acting punkah.
		R. Kennedy, Esq.	Do. do.
		Mr. Smith.	American printing Press.

T. T. PEARS,
Chairman.

Madras, June 5, 1857.

CLASS VI.

MANUFACTURING MACHINES AND TOOLS.

JURY.

Lieut. Col. F. C. COTTON.
Major G. Y. SIMPSON.
Major J. MAITLAND.
W. B. WRIGHT, Esq.
R. KENNEDY, Esq.
Colonel A. COTTON.
Colonel P. HAMOND.
Captain W. C. BAKER.
General F. BLUNDELL. C. B.
Mr. Commissary J. CURRAN, *Reporter.*

The present display of manufacturing Machines and Tools in comparison with those exhibited in 1855 wears a greatly improved aspect; being of a far superior, and comprehensive description, and more varied and perfect in kind. Native prejudice at least in Madras and in the neighbourhood of other localities of European operation and enterprise appears giving way to the superior appliances and contrivance of European skill and science. This is exemplified in many of the articles sent to the exhibition by native exhibitors, in which partially successful attempts have been made to copy the European style of work, although the means employed and method of application to effect the same result, appear and are defective in many respects. There can be no doubt that in the course of a few years hence, great advance will be made by the natives of the country towards substantial improvements in this most important branch of mechanical Art, if encouragement be held out, and European machinery more generally introduced. At present the sources of information on this subject are confined to the Railway Department; the Government works at Dowlaishwarum, and the individual efforts of the Civil Engineers in their employ. It is surprising and to be regretted that nothing in this Class (VI) is exhibited by the East Indian Iron and Steel Company from their Works at Beypore, which should be made one of the greatest agencies of improvement in this Presidency.

The Jury arrange the machinery represented by this class under three heads.

I. Machines imported from Europe.

II. Machines made in the country by Europeans or under their agency.

III. Machines made in the country entirely by natives.

I. Machines imported from Europe are the following, viz.

7335. Grooving or Rebating machine for timber, makers Brown Marshall and Co. Birmingham.
7336. Saw Bench by the same makers.
7337. Planing machine for iron 3 feet stroke. By Smith Peacock and Tannett Leeds.
7338. SlottingMachine for iron by the same makers.

These machines were sent out from England for the Madras Railway Company, Locomotive Department, and are exhibited by W. B. Wright, Esq. the Superintendent; they are machines in general use in England, and are essentially necessary and well adapted for the works of the Railway Department.

The Grooving or Rebating Machine is a very valuable one, as it not only performs these two operations ; but is also adapted for cutting all sorts of moulding by arrangement of different kinds of cutting tools, as well as sawing Timber of small scantling.

The Saw Bench performs the work of cutting curves of various radii, which it does with facility, accuracy and neatness hitherto unequalled in the country.

The Slotting Machine is adapted for cutting slots in Iron for keys, cotters &c. as well as paring the sides of metal works either straight or curvilineal ; the works executed by this Machine far surpass any thing that can be effected by manual labor, either for neatness, accuracy or despatch.

These Machines are the first of their kind that have been brought into operation in Madras.

The Planing Machine is useful for planing metal surfaces, which is done better and cheaper than by hand labor.

The Jury consider that the best thanks of the Committee are due to Mr. Wright for the very skilful arrangement of the whole series, and for bringing them into practical operation by means of Steam Power driven by a Portable High Pressure Engine of 6 H. P.

The working of the whole of this Machinery appears to afford the highest gratification to the visitors of the Exhibition, and especially to the natives ; as every Machine in operation attracts crowds of spectators, some of whom are lost in

wonder, while there is no doubt that others are deriving instruction and durable information. The Jury award a 2nd Class medal to W. B. Wright, Esquire,

5463. Cotton Gin (English) exhibited by the Arsenal of Fort. Saint George.

These gins were manufactured in England, but of American pattern, and sent out to this country with the intention to introduce them generally and to supersede the present rude and primitive Machine called " churka" used by the natives for cleaning cotton, the gins were made to be worked by hand by a single person.

The Jury are unable for want of information on the subject to state whether the attempt had succeeded or not. There is however an impression that the sharp saw teeth injure the Cotton ; and the Jury believe they are not popular. The best cotton cleaning machine the Jury consider to be that of the Chinese construction, introduced some years ago by Colonel Balfour C. B. In the absence of all reports the Jury are unable to enter more fully on this very important consideration.

9075. Circular Saw (Model) exhibited by C. V. Conniah Chettiar.

Machines of this description perform the operation of sawing timber by circular motion instead of vertical : there is nothing new in its construction.

II. Machines made in the country by Europeans, or under their Agency.

9311. " The Campbell Hammer" exhibited by Captain Thomas Hay Campbell, Commissary of Ordnance, Bangalore Arsenal.

The Hammer of which this is the model appears to have been worked in the Arsenal at Bangalore for some months with satisfactory results. The mechanical arrangement, by which a continued circular motion is made to give a free rectilinear movement to the Hammer is very creditable to Captain Campbell.

The Hammer is so arranged as to give two different lengths of stroke, and any other length may be given by increasing the size of the drum ; or the number of cog wheels on the intermediate spindle, and making a greater number of blanks on the circumference of them, corresponding to the different lengths required. The action of the Hammer is somewhat similar to that of the old Tilt Hammer, but is rather more unmanageable from the position of the framing.

To lessen manual labor and improve the ordinary means of manufacture is an effort always deserving praise, however short of success the result may prove and so in the present instance, for there can be no question that in working Iron more rapid blows with a lighter Hammer and an accumulated velocity are more to be desired than the operation of a weight falling through a short space and striking by the force of gravity alone, and that with considerable intervals, comparatively, between each blow.

The Jury consider this Hammer too complicated for temporary adoption under difficulties, and not perfect enough in its working to be recommended for use in the Arsenals.

The Jury have not received any data to enable them to compare the result obtained with this Hammer with manual labor and the sledge hammer, that is, the quantity of fuel, time, number of men required to turn out a certain amount of work by means of Captain Campbell's Hammer compared with a similar amount of work turned out by manual labor and the Sledge Hammer. This Hammer presents some features worthy of consideration as a Stamping Hammer for Dies.

With regard to this hammer the following is Mr. W. B. Wright's opinion, in which Mr. Curran coincides.

In the absence of Steam or water power, I consider the arrangement by which Captain Campbell's Hammer is made to deliver blows of power far exceeding that of hand labour as a very ingenious contrivance. It is no doubt a great desideratum, to have increased velocity, of blows, but I cannot concur in the remark, implying an objection to striking by the mere force of gravity. Look at Nasmyth's Steam Hammer, which is worked on the principle of gravity, the Steam raises the hammer only. Heavy blows are absolutely necessary to forge large works sound." The Jury award a 1st Class Medal to Captain Campbell.

Wood Turner's Lathe.
Cotton Spinning machine.
Rope making machine with hemp crushers complete.
Cotton Rope machine.
Model of a Saw Mill.

The first four machines are exhibited by E. L. Moncrief, Esq , in charge of the works at Dowlaishwarum, and the fifth by Mr. Malley the Superintendent of the same works. Mr. Moncrief's machines appear to have been designed by himself, and executed by the native workmen under his charge. In the whole of them there is nothing original, but the object of the exhibitor is evident ; it is intended to shew these machines as improved specimens of native workmanship. As such they are very creditable ; but still they are rough, and might with a little more care have been turned out more neatly.

The prices of these machines in the opinion of the Jury appear too high to admit of the possibility of their being purchased by native artizans.

The model of the Saw Mill is not constructed on sound mechanical principles, and the Jury are unable to urge any recommendation in its favor.

7842 Model of a brick-making machine exhibited by W. J. Addis, Esquire, Executive Engineer Chittledroog Division, Mysore.

This model does not appear to be perfect, it

merely exhibits the principles of brick-making, and the explanation appended to it gives the mode of working it in a general way without entering into details. At first sight it appears a machine of some promise, but on a closer examination many defects become apparent, such as the difficulty of expeditiously taking out the bricks after they are formed, as also the filling of the mould with clay of uniform consistence. It is however considered by the Jury as a praiseworthy attempt at improvement in the method of making bricks in this country.

Fibre crushing machine and Rope making machine exhibited by the Madras Industrial School of Acts.

This fibre crushing machine is an improvement on the one formerly used in the School of Arts; and is a good and effective machine for that purpose.

The Rope making machine is of the usual kind for making ropes of four strands

Tauning	*Mill.*
Buffing	,,
Wheat	,,
Rice	,,
Buff	,,

These are all models, and are exhibited by the Commissary General, Colonel M'Cally, they are all well made. Full size machines like these are in operation at Hoonsoor. The Buffing Mill is intended for the manufacture of all the belts for the Army. The machines were all projected, constructed and brought into operation by Sub Conductor Gage of the Commissariat Department, which the Jury consider very creditable to him and award a second Class medal.

These models were exhibited in 1855 and had received the notice of the Jury on that occasion.

51. A Large Bellows exhibited by Dr. Hilbers.

From the discription and explanation given by the exhibitor, this Bellows appears to be a useful article, but the Jury have not had an opportunity of judging of its merits. Its usefulness can be tested only in a large workshop.* The remarks of the exhibitor are herewith appended.

" The model of constant action Bellows and blow pipe. The muster is made of a series of frames as being less likely to warp than planks are; but a similar bellows made of planks with metal valves, has been in constant use for 14 months past without requiring any repair. A Bellows of this description made of sheet Iron would cost but little, and as it is swung from the roof above it when in use, the additional weight of iron would only add to the steadiness of the action and efficiency of the blast.

A child of ten years of age can work it without previous practice and the Bellows Boy sits to his work. For Jeweller's and Brazier's work an intermitting action is often required. This is obtained by working the small supplemental Bellows of the air chambers by the hand straps.

This muster bellows would probably answer well for an Organ, Seraphin or similar instruments."

Presented to the Madras Museum
By Assistant Surgeon W. HILBERS.

Hoonnor.

5464. Cotton Gin (Country) exhibited by the Arsenal of Fort St. George.

This gin has been made under European agency, and is an efficient machine for cleaning cotton; it is a modification between the Chinese hand Gin and the native "Churka" and is intended to be worked by a single person. It is certainly an improvement on the country instrument, and will Gin cotton cleaner, than the Chinese hand Gin, but perhaps not in such large quantities.

7361	40	pr. of Tongs assorted.
7362	1	Fore Hammer.
7363	1	Quarter do.
7364	2	Hand do.
7365	3	Set do.
7367	10	pr. of Fullers of sizes.
7368	1	Flat face.
7369	1	Flatter.
7370	10	Gouge chissels of sizes.
7371	6	Flat Chissels.
7372	5	Square Punches.
7373	5	Round do.
7374	1	Flat do.
7375	7	Pointed do.
7376	6	pr. of Swages assorted.
7677	1	Set of spanners from half to one inch.

These are manufacturing tools peculiarly adopted and suited to every workshop in which heavy iron is forged as they are for the works of the Railway Department, and were made there, and exhibited by W. B. Wright, Esq. Locomotive Superintendent.

8004 Large Loom.
8005 Warping Machine.

These are the same as an English hand Loom and Warping Machine, and are said to be made by a native, who learnt the Act of making and using them from a European. These Machines have become a source of ample remuneration and income to the owner, and there is reason to believe as the efficiency of these Machines become known to other natives, they will adopt similar means, and gradudually abandon their present rude mechanism, employed in weaving.

III. Machines made in the country entirely by natives.

8445. Models of Paper Mills.
8446. Beating Engine.

* Since this report was written the Bellows has been tried at the Gun Carriage Manufactory and has not proved so satisfactory as the sanguine expectations of the exhibitor. It answers pretty well for small work but does not give sufficient blast for heavy work.—*Reporter.*

8447. Beam Cutting Press.
8448. Glazing Machine.
9074. Fibre Cutting Machine exhibited by C. V. Conniah Chettiar.

These models have all been designed from European patterns and made up by native workmen belonging to the exhibitor's Paper Manufactory at Paralore. The chief merit in them consists in the combination of the whole by means of shafting and geering to be worked by Steam Power. The credit of this is wholly due to the exhibitor, who appears to possess some talent in Art, and takes great interest in all such matters, and practises himself as an Amateur Engineer. The arrangement of the models shews his anxiety to bring them out in the most striking and pleasing manner possible. The execution of the work is imperfect, and admits of great improvement; it also points out the defective means at command in the hands of natives to produce superior manufacture and the necessity for introducing European appliances and Machinery into the country.

The Jury consider the whole as a very creditable undertaking and award a first class medal.

9314 Cotton model Churka.
9315 Do. Small, exhibited by Captain M. Davis, Superintendent of Police, North Berar.

These are the common contrivances of the country for cleaning Cotton, and are well known to all who have paid any attention to the subject of cleaning cotton, there is nothing peculiar in them to merit particular notice.

G. Y. Simpson.
J. Maitland.
P. Hamond.
W. C. Baker.
W. Baison Wright.
F. Blundell.
Isaac Curran, *Reporter*.

APPENDIX A.

No. 193.

From W. H. Bayley, Esq. Secretary to the Board of Revenue.

To Sir H. C. Montgomery, Bart. Chief Secretary to Government.

Rev. Dept.

From Bellary 6 in Cons. 29th April 1850 P. 4 @ 6.
From Cuddapah 13 do. in Cons. 18th April 1850 P. 21.

Sir,—In anticipation of their Report on the cultivation of cotton in the Provinces during Fusly 1258, the Board of Revenue direct me to request you will submit to the Right Honorable the Governor in Council, the accompanying Extract from the Reports received from the Collectors of Bellary and Cuddapah, and with reference to the observations of Mr. Pelly, to solicit sanction for the purchase of 25 cotton Gins from Darwar, for experimental use in Bellary and a like number for Cuddapah. The cost of each Gin will be 40 Rupees, and the total amount for which sanction is now solicited, is 2000 Rs.

(Sd.) W. H. BAYLEY,
Secretary.

Rev. Board Office,
Fort St. George,
29th April, 1850.

No. 20.

From C. Pelly, Esq. Acting Collector of Bellary
To W. H. Bayley, Esq., Secretary to the Board of Revenue, Fort St. George.

Sir,—I have the honor in obedience to the orders of the Board of Revenue received in your letter of the 28th February 1850, to submit the special Report of cultivation &c. of cotton in this District for Fusly 1258. The following is an abstract of cotton cultivation during the said year.

Description of Land.		Circar Land. Acres.	Circar Land. Assessment.	Circar Land. Demand.	Enam Land. Acres.	Enam Land. Assessment.	Total. Acres.	Total. Assessment.
			Rs.	Rs.		Rs.		Rs.
Dry.	Black Land.	1,25,142	1,91,374		88,870	1,46,291	2,14,012	3,37,665
	Mixed Land.... ...	16,138	12,912		10,632	9,969	26,770	22,881
	Red Land..., ...	23,617	8,114		5,579	2,689	29,169	10,803
		1,64,897	2,12,400		1,05,081	1,58,949	2,69,978	3,71,349
Irrigated.	Garden Land.	197	601		82	379	279	980
		1,65,094	2,13,001	1,61,843	1,05,163	1,59,328	2,70,257	3,72,329

There were it will be seen upwards of 2,70,000 acres sown with Cotton.

2. Though this Statement was inadvertently omitted to be entered in the Jammabundy Report, the subject has not been lost sight of by me. Since I took charge of the District, I have been engaged in endeavours to improve this great staple of the Bellary District. The Ryots have been advised to pay more attention to the picking and cleaning the Cotton and experiments to improve the staple by again introducing the foreign seed have been made and are still in progress.

3. In a letter dated 31st May 1849. to Dr. Wight, (copy of which I have the honor to enclose) I made a full report of some experiments made with the Mexican seed in Fusly 1258. These experiments I thought very unsatisfactory, but Dr. Wight attributed the failure to the blight and gave me much encouragement to prosecute them again. I have done this, and the result will be detailed in my next report for Fusly 1259. Dr. Wight forwarded a bandy load of seed from Coimbatore which has been distributed over the District and the produce of which is now gathering in.

4. Dr. Wight also promised to send me two saw Gins for cleaning the country Cotton. But these I have never received. It is very desirable that these Machines should be introduced into Bellary with as little delay as possible and I find I can procure them at Dharwar at a cost of 40 Rupees each and if the Board will allow me to order a few I shall exert myself to give them a full trial.

5. The manner in which I became aware that such Gins were procurable, was as follows. In the printed Book of Cotton experiments in the Southern Maratta Country lately sent to me from the Board of Revenue. I observed that the new Orleans crop of 1848 in the Dharwar District was almost an entire failure, and there the report ended. Desirous to know the result of the following year and the prospects of the present season I wrote a note to Mr. Bell the Collector enquiring about the crops. In a private communication with which I have been very kindly favoured by that gentleman he informed me that the new Orleans Plant had met with a very great check in the year 1848-49, but in the present year 1849-50 it was again recovering and at the same time he informed me respecting the saw gin and though only a private communication that Gentleman will not, I am sure, object to my quoting his own words. "We are making up in "the factory a very excellent description of saw "Gin, which can be worked all day by 2 men alternately and cleanse about 1½ Maunds (28 lbs. 1 "Maund) of seed cotton the hour and costs only "Rupees 40. If you have nothing of the kind to "clean Cotton in Bellary you should introduce it "The Department here will supply any number "you require before the next season. This instrument does nearly three times the work which the "Manchester Cottage Gin, of which you have read, "is capable of performing."

6. I am not at all sanguine of general success in the Mexican Plant (the result of the present year will determine my measures for the future), but I entertain great hopes that the introduction of the saw Gin will be attended with as good results as at Dharwar or elsewhere, and I cannot do better, in concluding this report, than to request that the sanction of Government may be obtained for procuring, as soon as they can be got ready, 25 Gins from Dharwar.

Bellary District, Collector's Office on Circuit, Ramandroog, 6th April 1850. (Sd.) C. PELLY, *Acting Collector.*

No. 379.

From C. Pelly, Esq., Acting Collector of Bellary.
To Dr. Wight, Superintendent of Cotton Farms Coimbatore.

Sir—1. In accordance with your request I have the honor to report the result of the experiment made with the Mexican Cotton seed in the respective Talooks of this District where it has been sown, I beg to direct your attention to the enclosed statement.

2. It has been sown in both Regud,* Masub,† and Laul,‡ soils, and in one case only has irrigation been resorted to.

3. In the Hurponhully Talook experiment were made in Masub land only, almost all the plants were destroyed by blight and the Crop obtained from the few surviving ones was almost nominal. The seed in this case was not sown until September.

4. In KoodlegheeTalook experiments were made in both Black and Masub soils, in the former the plants at first presented a very healthy appearance but before arriving at maturity were attacked by blights which injured the leaves Akulo jgi to a considerable extent but subsequently disappeared. This however no doubt prevented the produce being as extensive as it would otherwise have been. It gave an outturn of 6¾ seers of uncleaned Cotton per each seer of seed sown. In the Masub it was a total failure, very few plants, ever appeared above ground, those which did were irrigated, but without success; in this case alone has irrigation been resorted to, the plants did not at any stage present a healthy appearance nor was there any produce.

5. In Hoomuhadagaly the seed was sown in fine Masub soil in two villages: in the month of July it was free from blight, most productive, averaging

* The Regud is the Black Loam or the common Cotton soil of Bellary, Dharwar, &c.

† Masub is as the term denotes a mixture of Red and Black: it is fine land, and in the Western Talooks as rich as the Black soils.

‡ Laul is the Red and generally the least productive soil unless irrigated.

27 seers of cotton for each seer of seed and the cotton of a superior description. The seed obtained from the cotton has been carefully preserved and will be sown again at the same time this year together with some fresh seed. The gathering took place from November to March and the result has been most satisfactory; but it must be borne in mind that the rains were very seasonable and the land selected for the experiment some of the best to be found for the purpose and that there was no blight. It is also to be noted that rains fall to the Westward under the Western Monsoon much more regular and earlier than in the other divisions of this District. July is the regular sowing season there, not so in the other Talooks noticed in the statement. Hoomuhadagaly is the most Western Talook. Hurponhully is equally favoured in this respect, but the crop there was lost by blight whether from being sown too late or not I cannot say

6. Adoni. Experiments were made in this Talook in the Black land only, and were almost a total failure, the plants were much injured by blight called Jegee Rogum, and the produce very small averaging only $2\frac{1}{4}$ seer of cotton to a seer of seed: the seed was not however sown until October, the usual time of sowing in this Northern Talook.

7. Goollem. In this case also the seed was sown in Black land by special order as soon as I received it from you; the plants were fine and promising until they attained the height of about two feet when at least half of them were destroyed by blight but of a nature different from that alluded to, in the case of Adoni called Masee Rogum. In this case the plants became quite black crumbling in the hand like charcoal; whereas in the Adoni Talook the leaves alone were affected, and if rolled in the hand were found to be covered with a glutinous substance. The produce was only 5 seers of cotton per seer of seed.

8. Punchapollem. Experiments were made in the Black land some of the plants perished from blight. The produce notwithstanding would have been satisfactory had it not been for an unusual quantity of rain which fell in this Village and much injured the growing plant. The return was 8 seers of Cotton per each seer of seed.

9. Gooty. The seed in this case also was sown in the Black land in October, and though the growing plants suffered partially from blight the result was very satisfactory though by no means as much so as in the case of Hooniuhadagaly Talook. It yielded on an average 13 seers of Cotton per each seer of seed. The Amildar has applied for a further supply of 10 Maunds of seed, but the Ryots do not seem much disposed to repeat the experiment.

10. Tadputry. The experiments were made in two Villages belonging to this Talook, which is the most Eastern on the Cuddapah frontier; and contains fine Cotton soil and the finest race of cultivators. In the first village, Tadputry, from the time the plants were about a foot high they were more or less affected with a blight called here Wodapa Rogum which though at first it only affected the leaves, eventually destroyed both the flowers and growing pods; there was not therefore any produce. In the second village, Pootloor, the same blight prevailed though not to the same extent and eventually partially left them, the produce was however but small averaging $4\frac{1}{2}$ seers of cotton for each of seed.

From the above it will appear that the experiments have been attended with success in three villages only, in Hoomuhadagaly, Soghee in Hoomuhadagaly Talook and in Conacondlah in the Gooty Talook; in the former Talook the seed was sown early in July, thereby obtaining an advantage from the Western rains which were remarkably fine in the Western Talooks this year.

11. From the unsatisfactory outturn in the other Talooks where the seed was sown in the usual seasons, and in the best selected spots I am afraid the experiment will if repeated not succeed. I propose therefore more particularly to try it again in Hoomuhadagaly and orders to this effect have been given, but should you supply me with any large quantity of seed I shall again try the experiment in the great Cotton Talooks. It is proper to mention that the cotton crop generally this year was bad.

12. Some seed was sent to the Sub-Division which is principally red soil, and I beg to enclose copy of a Report from Mr. Mayne who, you will see, speaks highly of the success of the experiment tried in the Anuntapoor Talook; but I entirely concur in his observation in the last para of his letter that it is desirable to have artificial irrigation to ensure the complete success of the growth of cotton in the red soils of those Talooks.

13. I shall be happy to receive any suggestions you may be pleased to favour me with for future experiments, but I am not sanguine that the experiments will prove successful in this District generally which perhaps is the driest District in the whole of India, and I fear that from that cause, unless irrigated it would be vain to try the sowing in April and May as suggested in your letter of 30th September. But with the present facts now before you, intimate acquaintance with all the details of cotton may enable you to suggest what would be the best mode to proceed in future.

14. But I am desirous that we should not confine our attention to the rearing of new and foreign seed but improve the cotton indigenous to the Districts by a better mode of cleaning and preparing it for the market. I should be obliged if you have any improved Gins, and are authorized, as I believe you are, to furnish them, by your sending me one or two for trial and favour me with such further advice as you think may be conducive to the great object of Government, viz: the production of an article of a quality suitable to the English market.

(Signed) C. PELLY, *Acting Collector.*

Statement shewing the produce of the Mexican Cotton seed sown in the following Talooks.

Names of the Talooks.	Names of the Villages.	Cotton seed sown in Circar land. Description of Soil.	Numbers of the Field.	Acres. A.	G.	A.	Assessment of C. Pagodas. P.	F.	As.	Date of sowing. Date.	Months.	Quantity of seed Sown.	Irrigated or not. Irrigated.	Not Irrigated.	Attacked with disease or not. Diseased.	Not attacked.	Time of gathering. From. Month.	Date.	To. Month.	Date.	Number of gatherings.	Total Produce of uncleaned cotton.	Average produce of each gathering.	Average of produce in Col. 16 to each seer of seed sown Col. 8	Remarks.
1	2	3	4	5			6				7	8	9	10	11	12	13		14		15	16	17	18	19
				A.	G.	A.	P.	F.	As.			Seer.													
1 Hurponhully...	Hurponhully...		114	.	4	..	...	...	3	...	Sept 1848	4	..	1	1	..	1849 Dec.	...	1849 Feby.	28th	3	1¼	½	¼	These Talooks are to the West of the Bellary District.
			151	..	2	8	..	..	1	...	Do.	5	...	1	1	...	Do,	...	Do.	28th	1	¾	¾	..	
	Total...			...	6	8	..	..	4			9										2			
2 Uoodlyghee...	Codehully	Regud.	11	...	7	8	...	1	4	30th	Sept. 1848	5	..	1	1	...	1848 Feb.	...	March	12th	5	34	6¾	6¾	
			406	..	3	..	...	..	5	15th	Oct.	3	1	...	1 1	...	...	...	...	...		...	...	...	
	Total...			.	10	8	..	1	9			8										34			
3			297	..	6	...	...	1	7	20th	July. 1848	4	.	1		1	1848 Nov.	28th	February	28th	6	108	18	27	
			44	..	4	4	.	...	12	14th	Do.	4	...	1	...	1	Do.	1st	March	31st	6	108	18	27	
	Total...			...	10	4	...	2	3			8										216			
4 Adonic.........	Moudgeny.....	Regud.	140	...	7	14	.	..	8	10th	Oct. 1848	5½	..	1	1	...	1849 March.	8th	April	9th	3	13	4½	2½	
	Purvatapoor...	Regud.	34	..	3	12	.	.	6	10th	Do.	3	..	1	1	...	Do.	8th	Do.	25th	3	7	2¼	2¼	These are the Northern centre and Eastern Talooks.
	Total...			. .	11	10	...	...	14			8½										20			
5 Goollem........	Huttebelgul...	Regud.	406	...	15	...	...	2	4	2nd	Aug. 1848	9	...	1	1	...	1849 Jany.	...	March	...	4	45	11¼	5	
6 Punchapollem.	Pervaly.........	Regud.	227	...	12	6	...	2	4	7th	Oct. 1848	6	. .	1	1	...	1849 Feby.	...	April,	...	4	48	12	8	
7 Gooty..........	Conacondlah ..	Regud.	172	...	12	5	..	3	1	25th	Oct. 1848	5½	...	1	1	...	1849 March.	4th	March	31st	3	72	24	13	
8 Tadputy.... ...	Tadputy.......	Regud.	18	...	1	8	...	..	5	5th	Oct. 1848	3	...	1	1	..	......	...	......	...	...	...	...	...	
	Poothoor.......	Regud.	111	...	4	8	...	1	4	6th	Do.	6	...	1	1	...	1849 Jany.	...	March	...	2	28	14	4½	
Sub Division.	Total...			...	6	...	...	1	9			9										28			
9 Anuntapoor ...	Anuntapoor ...	Regud.	71	..	11	..	...	...	7	11th	Aug. 1848	6¾	...	1	1	...	1849 March	1st	April.	7th	3	36	12	5½	This is the experiment tried by Mr. Mayne and reported on in his letter of the 26th February 1849.
	Cundacoor.....	Red soil.	72	..	19	2	...	...	7½	11th	Do.	6¾	...	1	...	1	Do.	1st	Do.	7th	3	120	40	17½	
	Total...			..	30	2	...	..	14½			13½										156			
	Grand Total. .			2	34	11	1	4	14½			76½										621			

Bellary District Collector's Office, on Circuit, Toranangul, 31*st May* 1849.

(Signed) C. PELLY, *Acting Collector.*

No. 9.

From, D. MAYNE, Esq. Ag. Sub Collector of Bellary.

To C. PELLY, Esq. Ag. Collector of Bellary.

Sir,—In reference to the printed circular dated 6th March 1848 from "Robt. Wight Surgeon, Superintendent Cotton Farms," I have the honor to state that on assuming this office in June 1848 the ground was in so parched a condition that ploughing was impracticable and seed if sown would, without irrigation, in all probability have been destroyed: and an opportunity was not available until late in August when the amount of seed at hand was put in the ground and germing gave very different results.

2. That sown in red soil produced very fine plants and an abundant crop to the extent of a half more than is attainable from the native country plant, afforded entire satisfaction and drew forth the unbounded applause of the rayet in whose land it had been raised as well as others who witnessed it.

3. The remaining seed was, contrary to positive orders, sown in black soil, germed tediously and produced weakly plants with deficient flowers and inferior pods that became a prey to an insect of the weevil species that bores through the outside cover and destroys the embryo Cotton in the pod.

4. This insect was also, but in a less degree, very destructive to the first mentioned produce, in the same way as it prevails through the common Country Cotton crops, but probably will not be present in case of the seed being sown after the early rains of May.

5. It is evident that if conducted agreeably to the directions contained in the said circular the Mexican cotton would be found a very remunerative crop throughout the red soil lands of this District and highly satisfactory to the ryots who declared themselves astonished at the produce and most desirous of propagating the new plant.

6. Strict directions were given for preservation of all the seed that was produced for sowing *immediately* after the early rains shall have rendered the ground arable and I would suggest the propriety of procuring a large supply of seed from Coimbatore and encouraging the more general cultivation of the plant by particular orders to the heads of Villages strictly enforcing the necessity of attention to the description of soil and season of the year adopted, by which only can complete success and confidence of the ryots in the novel practice be ensured.

7. The nature of the climate is so arid that it certainly would be desirable always to have artificial irrigation by wells available, that in case of protracted drought obtaining as was the case in the past year, water might *occasionally* be applied and thereby render the crop certain instead of a hazardous speculation as it otherwise would too often be found impelling the people to their time-revered practice of waiting for later rains.

(Signed) D. MAYNE, *Acting Sub Collector.*

Bellary District Sub Collector's Office, on Circuit, Murrymakoolapully, 26th February 1849.

No. 21.

From J. H. COCHRANE, Esq., Collector of Cuddapah.

To W. H. BAYLEY, Esq., Secretary to the Board of Revenue, Fort St. George.

Sir,—1. I have the honor to submit my special Report on the capabilities of this District as regards the cultivation of New Orleans Cotton.

2. The New Orleans or Mexican seed has been for the last two years experimentally sown in patches, in the rich black soils of the Cotton producing Talooks, after the setting in of both the S. W. and N. E. Monsoons in order to a fair trial being obtained in reference to the general peculiarities of climates and seasons. The same seed has also been sown in the lighter descriptions of garden soils which are moderately assessed and in lands under new wells bearing a dry assessment.

3. Samples of the produce have been sent by the Tahsildars for inspection, and they have been required to report from time to time on the state of the growing crops, and on the harvest result of the same and I have availed myself of the opportunity I have had of personally inspecting the plants in various localities.

4. The result of the experiments shews, that the plants sown in the early Monsoon in June and July have thriven the best, as regards such as are entirely dependant on the season and periodical rains, for means of moisture, crops sown at this season are gathered in September and October, and though deprived of the bright sunny weather experienced in March and April when crops sown on the latter or N. E. Monsoon come to maturity, still the disadvantage appears to be counteracted by the benefit derived from additional moisture obtained during the former season, following the setting in of the S.W. Monsoon.

5. In respect to crops so raised on dry land I fear the experiments do not give promise of a satisfactory result, as I at one time anticipated, and it was not until I visited the Cotton producing Talooks on Jamabundy for the current Fusly that my opinion has undergone this change. The plants sown in the preceding Fusly having on the whole thriven tolerably well, led to a hopeful conclusion, but the want of sufficient moisture which has impeded the growth of the plants for the current Fusly, has clearly demonstrated that the uncertainly attendant on a shower of rain being experienced when re-

quired, must at all times render the result of the harvest of these crops precarious.

6. It may safely be stated that high temperature is not injurious to the plant which has produced abundantly during the hottest weather when cultivated under irrigation. It however requires more moisture than the seasons generally prevalent in this District can lead us to expect will be experienced. It has been noticed (in respect to dry cultivation) that in such favoured localities where a good shower of rain has fallen at the time needed, satisfactory results have ensued, the plants having been enabled to strike their roots deep into the soil, which from its clay nature retains moisture for some time sufficient to render the plant independent of further rain, while other plants sown at the same time and in soil equally rich, but which did not derive the same benefit of a fall of rain yielded indifferently and partially failed. In this District periodical rains do not follow the setting in of either Monsoons to the extent required to ensure success in the culture of the American plant, partial showers may be received in the months of July, August during the one season, and in November and December during the other, and such would perhaps secure an average crops, but this is a contingency regarding which the cultivators would not like to run any risk, though in respect to the indigenous Cotton, they are indifferent on this score as these crops are not generally sown unless the fall of rain during the N. E. Monsoon has been sufficient, and, once sown, they afford a tolerable yield should no rain even have fallen up to the period they arrive at maturity, a circumstance which must be accounted for by the plant being more hardy, and from its striking its root more quickly into the soil.

7. The want of moisture periodically appears therefore to be the sole drawback to the successful production of Mexican Cotton on dry lands dependant entirely on the seasons, a disadvantage however in this District which, the experiments that have been made shews can be overcome, by means of irrigation. There can be no question that this description of Cotton may be produced to any extent under irrigation and in comparatively very inferior soils. The Plants that have been experimentally sown in lightly assessed Garden lands, and in new well lands, (on the latter of which the dry assessment is only leviable), have in all instances yielded abundantly. They were sown during the month of July, and received only 7 or 8 waterings at different intervals.

8. As the consumption of water sufficient to ensure a satisfactory crop is thus compartively moderate, and as consequently there is little labour and trouble attendant on raising these crops compared with other descriptions of produce under irrigation, the most sanguine hopes may be entertained in respect to the culture of American Cotton in the descriptions of land above mentioned, provided there was a ready demand for exportation a demand which as regards this superior quality of Cotton has not been locally experienced in the principal markets for all kinds of agricultural Produce. The additional cost of raising the produce in reference to labour and expence and to the rent leviable on the land, is fully compensated by the increased produce that is raised.

9. It is to be observed that the American Cotton is not so well suited to the wants of native manufactures as the indigenous kind while one of the objections (under the uncertainty of renumerative prices being occasioned by the demand) which the cultivators seem to have to the culture of the Mexican plant is that the seed does not possess the same oily substance and consequent nourishing property as an article of food for cattle, a matter, it must be admitted of some consideration.

10. Prejudices to be overcome, apathy or unwillingness to engage in agricultural pursuits out of the usual routine, cannot I think be justly imputed to the Ryots of this District. They seem willing enough to apply themselves to the production of an article of agriculture from which they are led to suppose such valuable results conducive to their interest will be obtained, but it is very necessary that they should be practically convinced that such will be the case, and this must be effected by the demand inducing parties to make advances and to agree with them for the produce at remunerative prices, for otherwise it can hardly be reasonable to suppose that they would be particularly anxious to apply their lands to the cultivation of an article required by the English Manufacturers, when they might turn the labour and industry to better account.

11. The advances that might be so made to the cultivators, and the purchases so effected by them at prices regulated by the demand in the open market, would greatly tend to effect a saving in the cost of production consequent on the non-employment of middle men, while it would place Ryots who may be in want of funds for the means of carrying on, or extending their cultivation, above the necessity of borrowing, and of giving security for such loans on the growing crops, which at maturity they would most probably be obliged to dispose of below the market price.

12. Premising that any quantity of Mexican Cotton might be produced, if English Capitalists employed their agents to make purchases at prices remunerative to the producers, the question is whether such prices would be profitable to the consumers whether in fact the article could be sold in competition with the produce of America.

13. The accompanying detailed statement has been prepared on the best information I have been able to collect from every enquiry made, from the

perusal of which some opinion may be deduced on so important a point.

14. The result as to the profit derivable by the cultivator is satisfactorily obtained by comparing the constituent elements in the way of Costs, that would make up the sum total of a candy or lb. 500 of indigenous seeded Cotton, grown entirely on lands dependent on the seasons, and of a candy of American seeded Cotton raised under irrigation with the prices of the two descriptions of produce. It is calculated that it requires 8 acres of dry land to produce 4 candies or 2000 lbs of seed Cotton of the indigenous kind, from which one candy of seeded Cotton wool is obtained, the cost of production including average assessment on this quantity of land (computed at 2 Rs. per acre) being it will be pereeived 36-9-4. The price of 4 candies of this seed Cotton is estimated at 58-4-0 leaving a net profit to the cultivator of Rs. 21-10-8 for every 8 acres of land cultivated. It will be observed that the price per candy of seeded wool is entered at 47, Rs. 11-4-0 being allowed as the sum procurable for the seed.

15. The net profit derivable in raising the same quantity or a candy of American seeded cotton under irrigation is estimated at Rs. 26-12-6, the produce per acre being not only considerably larger but the proportion of wool to seed also greater being in the proportion of about 33 per cent while it is about 25 per cent as regards indigenous Cetton. The price of the seeded Mexican Cotton moreover is higher, being calculated at 63 Rs. per candy or about 34 per cent or ¾ in the lb over that accruing from the sale of the native cotton, though I believe the price in the British market in favor of Mexican Cotton has been as high as 1d and ½d the ℔ according to which the profit derivable would be proportionately greater.

16. It requires 3 acres of land (of the description specified) under irrigation to produce this quantity of seeded American Cotton, the average assessment on which being Rs. 18 (or 6 Rs. per acre) is very little higher than the assessment on the 8 acres of dry land on which this quantity of the indigenous kind can be raised, which trifling excess combined with the increase in the charges incurrible, is more than counterbalanced by the price the superior article commands at the lowest calculation.

17. It will be observed that on the same computation the profits derivable in raising this quantity of seeded American Cotton on lands under new wells is considerably greater owing to the light assessment on the dry lands, but this profit of Rs. 41-2-6 is reduced to Rs. 32 on allowing the Ryot 12 per cent per annum on the cost and outlay expended in the construction of the new well estimated on the average at Rs. 100-0-0.

18. The assessment taken on the average above specified of Rs. 2 per acre as regard dry lands and at the rate of Rs. 6 per acre for lands under irrigation cannot be considered high compared with the price of the artiele, when it is considered that the cost of production including such rent is equal to 62 and 53 per cent respectively of the value of the produce raised on garden and new well lands. The yield of both descriptions of land under irrigation recokoned on a par, according to which as computed the cultivator derives 38 and 47 per eent of the produce of his garden and new well lands to reimburse his expences.

Cost of Production.	Price of Produce	Centage.
Indigenous. 36 9 4	58 4	63
American 43 11 6	70 8	62
37 5 6	70 8	53

Profit	Price of Produce	Centage.
21 10	858 4	37
26 12	670 8	38
33 2	670 8	47

Particulars of price at the place of cultivation as well as cost of transit, freight &c, for exportation.				Market price at which a Candy of 550 lbs. of Mexican Cotton is sold in England calculated at an average rate of 5½d per ℔.	Comparison between Cols. 4 & 5.		Centage between Cols.1 & 6.	Centage between Cols. 5 & 4.
Price per Candy of American cotton in the District.	Cost of Transit to Madras per Candy	Cost of freight per Candy calculated at Rs. 32 per Ton of 20 cwt. or 2240 lbs.	Total Cols. 1-2 and 3.		Increase or net profit at Home.	Deerease.		
1	2	3	4	5	6	7	8	9
63 0 0	8 0 0	7 0 0	78 0 0 or £ 7 9 6	119 9 1	41 9 1	0 0 0	66 0 0	66 0 0

19. On reference to the commercial quotations of the money market in England it would appear that the new Orleans or Mexican Cotton has been selling as high as 6½ the lb. and Madras indigenous at 4 and 4½ assuming 5½ to be the average as regards the Mexican kind and the average of Freight £ 3 per Ton of 20 cwt or lbs. 2240, the result, as marginally noted would exhibit a profit of Rupees 41-9-1 or £3-19-8 derivable on the sale per candy of 500 lbs. in the English market the price at which this quantity can be sold for being calculated at Rupees 119 or £ 11-9-2, while the comparative low price at whieh the same quantity can be brought to the English market, allowing a remunerative profit to the producer and including charges for cost of Transit to the Port of shipment and for Freight is Rupces 78 or £7 9s. 6d.

20. The above on the whole appears to me satisfactory and I am therefore induced to think that so far as this District is concerned, the obstacles which are supposed to have retarded the cultivation of this staple of superior quality may be overcome, provided the difficulty under which the progress to improvement at present labours owing to the want of a ready demand in the District, was removed.

21. In respect to the improvement of the quality so much needed of the indegenous Cotton I fear the deficiencies in clearing and gathering will not be remedied unless the agents of capitalists place themselves also in direct communication with the cultivators of the soil make advances and exercise the necessary supervision. The introduction of the saw gin suitable for this variety will do much towards transmitting the article in a cleaner state to the Port of shipment, as also towards cheaping the production of cleaned Cotton by superceding the tedious method now in use.

22. With the system of agriculture no fault can reasonably be found and there is every reason to think that the indigenous Cotton though hitherto grown rather for the consumption of this country than for a foreign market, would not altogether be unsuited to the wants of the English manufacturers, if those who were most interested in its improvement and in extending its cultivation took the remedy in their own lands towards the attainment of a greater degree of cleanness in the article made purchases direct from the Ryots and rejected such as they considered bad, thus supplanting middle men whose objects it is to mix up as much trash and leaves &c. so long as they can find purchasers for an article so deteriorated.

23. In my Annual Report of the Revenue settlement for Fusly 1258, para 54, the increase in the cultivation of Cotton of the indigenous kind is shewn to have been acres 12,568-1-12 the land assessment on which was 20,479-12-4, no further remarks appear in this place necessary further than to state that a still further extension of the culture of the article in the black soils may be anticipated from the circumstance of 2663½ acres having up to this period been taken up on cowle agreeably to the Rules in force and that I have availed myself of the opportunity I have had of impressing upon the Ryots the importance attached to careful picking and cleanliness of the article, and of keeping unmixed the superior from the inferior kinds of Produce. I beg here to rectify a clerical error in respect to the average assessment on the lands cultivated with cotton during the past Fusly which should have been entered as Rupees 1-10-0 and not 3-3-0 as specified in para. 54 of my Report dated 31st December last.

(Signed) J. H. COCHRANE,
Collector.

Cuddaph District Collr's. Office, on Circuit at Muddenpully, 13*th April* 1850.

Statement shewing the Extent of land required to yield One Candy of American Cotton and the charge of Cultivation &c.

EXTENT OF LAND REQUIRED TO YIELD ONE CANDY OF COTTON AND THE CHARGES FOR CULTIVATION, &c.

		Quantity of indigenous Cotton raised on 8 acres of black land solely dependant on the Season.	QUANTITY OF AMERICAN COTTON RAISED IN 3 ACRES OF LAND IRRIGATED BY DIFFERENT SOURCES.			CENTAGE.								
			Quantity of Cotton raised in lightly assessed garden land.	Quantity of Cotton produced in land under new wells liable to dry assesst. only.	Average dry asst. of land under new wells together with interest at 12 per ct. calculated on the outlay.	Between Cols. 3 and 4.			Between Cols. 3 and 5.			Between Cols. 3 and 6.		
						Increase.	Decrease.	Centage.	Increase.	Decrease.	Centage.	Increase.	Decrease.	Centage.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Quantity produced.	1 Quantity of Cotton produced at 1 Candy of 500 lbs.	Can 4	3	3	3	... ...	1	25	... ...	1	25	... ...	1	25 ... ...
	2 Quantity of seeds	3	2	2	2	... ...	1	33	... .	1	33	... ...	1	33 ... ...
	3 Remaining quantity of seed Cotton	1	1	1	1	... ...	... ...	... ...	... .	... ...	... ...	... ...	... ...	... ...
Value of Cotton &c.	4 Average value of seeded Cotton per Candy	47	63	63	63	16	... ...	34	16	... ...	34	16	... ...	34 ... ...
	5 Value of seeds at 3 Rs. 12 A. 0. P. per Candy	11 4 ...	7 8 ...	7 8 .	7 8 ...	... .	3 12 ...	33	... ...	3 12 ...	33	... .	3 12 ...	33 ... ...
	6 Total Items 4 and 5	58 4 ...	70 8 ...	70 8 ...	70 8 ...	12	... ...	21	12	... ...	21	12	... ...	21 ... ...
Cultivating charges &c.	7 Cultivating charges	20 9 4	25 11 6	25 11 6	25 11 6	5 2 2	... ...	25	5 2 2	... ...	25	5 2 2	... ...	25 ... ...
	8 Amount of Assessment payable to Government	16	18	2 10 ...	11 10 ...	2	... ...	12	... ...	13 6 ...	84	... ...	4 6 ...	27 ... ..
	9 Total of Items 7 and 8	36 9 4	43 11 6	28 5 6	37 5 6	7 2 2	... ...	19	... ...	8 3 10	22	... 12 2	... ...	2 ... ...
Profit.	10 Net profit derivable after deducting charges as per Item 9 from that of No. 6	21 10 8	26 12 6	42 2 6	33 2 6	5 1 10	... ...	24	20 7 10	... ...	95	11 7 10	... .	53 ... ...
	11 Average yield per acre	2 11 4	8 14 10	14 ... 10	11 ... 10	... ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...
Centage.	12 Between Items 4 and 8	34	29	4	18	... ...	... .	... ...	... ...	... ...	... ...	... ...	... ...	... ...

Cuddapah District Collector's Office, on Circuit,
Muddenpully, 13*th April* 1850.

(Signed) J. H. COCHRANE,
Collector.

No 63.

From the Military Board.

To Major General The Right Honorable Sir Henry Pottinger, Bart. g. c. b. Governor in Council, &c. &c. &c.

Right Honorable Sir,

Agreably to the requisition contained in resolution of Government No. 349 dated the 23rd Instant passed on a letter from the Collector of Tanjore to the address of the Secretary Revenue Board, on the subject of a further supply of Cotton saw Gins, we have the honor to report for the information of your Excellency in Council that of the 42 saw Gins, 18 per "La Belle" and 24 per "Ferries," transferred to the Military Board in Extracts from Minutes of consultation dated 2nd and 6th November Nos. 935 and 1057 respectively, there are 20 now remaining in store, the others have been distributed as follows:

4 to the Collector of Coimbatore.
4 " " of Tinnevelly.
2 " " of Tanjore.
12 to Dr. Wight.

22

2. The 12 Saw Gins sent to Dr. Wight were not repaired in the Arsenal as that officer preferred having the requisite repairs to them executed under his own supervision the cost of repairing the others has amounted in the aggregate Rupees (82-12-5) Eighty two, Annas twelve and Pice five, viz. 70-11-9 Seventy, Annas eleven, and Pice nine, for those brought out by the La Belle, and Rupees 12-0-8 Twelve and Pice eight, for those received per Ferries, as per detailed statements submitted to us by the Principal Commissary of Ordnance.

3. In addition to the 20 saw Gins above adverted to as remaining in store duly repaired, there are 24 now received in January last per Llewelyn, but these we believe have not as yet been repaired, no report to that effect having been made to our Board.

(Signed) P. Montgomery, Brigadier,
Commandant of Artillery.

(Signed) T. T. Pears,
Major.

(Signed) G. Balfour,
Major.

Military Board Office, Fort St. George, 30th April 1850.

No. 554.

Extract from the Minutes of Consultation, under date the 5th June 1850.

Read the following letters.

From the Secretary to the Board of Revenue.

(*Here enter 29th April* 1850, *No.* 193.)

From the Military Board,

(*Here enter 30th April* 1850, *No.* 63.)

1. In their Dispatches of the dates noted in the margin the Honorable Court of Directors advised this Government of the shipment for the use of this Presidency of 12 cases each containing two "Cottage Saw Gins" in each of the Vessels "La Belle," the "Ferries" and the "Llwellyn," being in all 72 Gins; of the number received by the "La Belle" 4 were sent to Tinnevelly and 2 to the Chamber of Commerce, the remaining 18 Gins of this Consignment as well as those received by the "Ferries" and "Llewellyn" in all 66 were transferred by the Marine to the Military Board.

7th March 1849 No. 2
14th Do. Do. 3
30th May Do. 5
21st November Do. 15

2. From the report above furnished by the Military Board, it appears that 22 Gins have been distributed and that 44 remain in store, of which 24, or those brought out by the Llewellyn, have not yet been repaired.

4 to the Collector of Coimbatore.
4 to do. Tinnevelly.
2 to do. Tanjore.
12 to Dr. Wight.

3. Dr. Wight in his letter to the Marine Board dated 20th March 1850 wrote favorably of the working of these Gins and requested that all those remaining in Madras should be sent up to Coimbatore, a requisition which does not appear to have been complied with.

Dy. 16th April 1850 No. 24-25-

4. At a subsequent date* Dr. Wight having received applications for the purchase of these machines desired to be informed of the price to be put upon them and in Extract Minutes of Consultation 22nd April 1850 it was intimated to him that 25 Rupees for each Cotton Gin was a price suited to the Market, that there would be no objection to his selling even at a lower rate if necessary to encourage purchasers, but that to European applicants Rupees 30 should be charged.

* 25th March 1850 in Dy. 23d April No. 27-28

5. In their letter now before Government the Board of Revenue solicit sanction for the purchase of 50 Cotton Gins from Dharwar for experimental use in the Ceded Districts. The Collector of Bellary introducing the subject states that Dr. Wight promised him 2 saw Gins for cleaning the Country Cotton which he has not received, observing that it is desirable these machines should be introduced into Bellary with as little delay as possible and that he can procure them from Dharwar. The description given of the Dharwar Gin states that it "can be worked" all day "by 2 men alternately and "cleanse about 1½ Maunds (28 lb 1 Maund) of seed "Cotton the hour, and costs only 40 Rupees." The total cost of the 50 Gins indented for by the Board will at this rate be Rupees 2000.

6. It does not appear to the Right Honorable the Governor in Council that so many as 25 Gins can be required, merely for experimental purposes, in each of the Districts of Bellary and Cuddapah and

he is not prepared to sanction so large an outlay as that proposed by the Board of Revenue. He directs that the Collectors be desired to communicate with the Superintendent of Cotton Farms, who will furnish them with as many of the saw Gins now under charge of the Military Board, as may seem to him to be requisite and can conveniently be spared, and he authorizes each Collector to purchase for trial in his District five of the Dharwar Gins, the expense of the whole ten at 40 Rupees a piece being Rupees 400.

7. The Military Board will at once communicate with Dr. Wight and obtain his instructions in respect to the repair of those saw Gins which have not yet been repaired.

(Signed) T. PYCROFT,
Secretary to Government.

Coimbatore, 21*st September* 1850.

From Surgeon R. Wight, Superintendent Cotton Farms, Coimbatore.

To T. Pycroft, Esq., Secretary to Government, Fort St. George.

1. Sir,—I have the honor to transmit copies of two letters received from the Acting Collector of Tinnevelly conveying the intimation that neither the cotton dealers nor Ryots of Sevacassy seem disposed to avail themselves of the indulgence accorded to them by the orders of Government, of having their cotton cleaned at the Government Gin house free of charge.

2. Of this disinclination I have long been aware, both here and in Tinnevelly, which I believe originates simply in an apprehension of the Gin supplanting the Churka and thereby throwing their families out of an employment adapted to their habits, and on which all the females and boys under 14 can find almost constant occupation. Under the influence of such apprehensions their aversion is not to be wondered at, nor can it be blamed. I can even recollect the time when riotous assemblages of the rural population of England destroyed Thrashing Machines on the supposition that they would deprive them of their usual winter occupation. Time has shewn that they were mistaken and I believe the same will be the effect of the extended use of the Gin in place of the churka, but the change if ever brought about must result from European enterprize the natives will not of themselves adopt the Gin.

3. Up to the present time European merchants appear not to have interested themselves in the improvement of the cotton trade to the extent that they might and I think ought to have done; now however a change is in progress some are becoming aware that Gin cleaned cotton currently realizes from $\frac{3}{8}$ to $\frac{1}{2}$d per pound more in the Liverpool market than churka cleaned not merely as looking better because it contains less refuse and is consequently intrinsically more valuable. The difference of outturn of weight between the Gin and churka is nearly 3 per cent more from the latter, all of which consisting of sand &c., and becomes in the hands of the spinner mere waste and refuse. At this rate 97 lbs. of Gin cleaned cotton is at the lowest estimate worth 100 of charkaed, in addition to which there is a quantity of short nap attached to the seed which the churka removes and mixes with the proper staple but which the Gin leaves, that too is removed as waste by the spinner. Hence the higher prices obtained for Gin cleaned Cotton and if duly attended to by the local Merchant should I think induce him to give the preference to the Gin, the more so as he would thereby be saved the cost, freight and charges of 3 Bales of waste or "trash" as I believe it is called in America, in every 100 exported. These facts furnish the best reply that can be given to the preposterous outcry of the Gin cutting the staple, the value of which may be estimated by the fact that a sample of churka cleaned cotton I sent home was said to be cut in Ginning.

4. A further argument in favor of the Gin, which should weigh with the European merchant is its superiority over the churka in enabling him, by its speedy working to take advantage of favorable states of the market and its greater cheapness as shown by the table of comparative charges furnished in my letter of the 6th Instant and reproduced in the margin.

	Rs.	A.	P.
Hand Gin by contract,	3	14	0
Cattle machinery,......	4	1	2
Churka,..................	5	3	4

5. The inhabitants or rather Cotton dealers of Sevacassy have shown a nearly equal dislike to the introduction of the American Cotton into that neighbourhood, the cause of which I cannot so satisfactorily account for but suspect that it originates in an aversion to have Europeans located among them, lest their superior knowledge, honesty, and perhaps command of money should enable them, to some extent to injure their trade by breaking down the monopoly they have so long enjoyed. But whether or not this is the cause, it is certain that they have not yet ceased to throw all the obstructions in their power in the way of Mr. Coxton's success by preventing him getting land on which to cultivate American Cotton or Native Cotton to purchase. They have been so far successful that he has as yet only been able to purchase to a very small extent and to get some small patches of land, but these he has already sown and the crop so far appears most thriving. Judging from a very small field he had under crop in January last, I feel disposed to anticipate very favorable results from the trial in progress.

6. His predecessor Mr. Finnie took different views with regard to both growing and cleaning Cotton, but as his opportunities of trying either, while at Sevacassy were not extensive, his opinions can carry but little weight. I can only account for his preferring the charka to the Gin, on the supposition of its novelty to him, and his find-

ing it a more efficient machine than he had previously supposed, added to his imperfect knowledge of the comparative working properties of the two machines.

These combined with an aptitude or rather predeliction for forming decisive opinions from first impressions, which he was not sufficiently careful to correct by after consideration, and subjecting them to experimental proof, led him into many mistakes, our expeiience as well as that of his brother planters in Dharwar is directly opposed to his views, and resting as it does on very extensive trials, must be preferred to his convictions based on reasoning not facts with such evidence as I have adduced in favor of the gin as a means of cleaning even native cotton it must if the cotton trade materially extends, come into general use : the churka is too slow.

7th. On the subject of growing American cotton at Sevacassy and Aroopoocotta, he certainly succeeded in inducing several Ryots to attempt its culture, but did not show the way by setting the example. One of their fields that I had an opportunity of examining, left no cause for wonder at their want of success, as the land was bad, and so foul that the proper crop was choked with weeds and had the appearance of being very imperfectly cultivated. Mr. Cuxton's crop, though on land of the poorest description and sown nearly 2 months later, was, owing to better cultivation, much better. His land this season is better and being sown at a more favorable season will, I trust, tend to extend the cultivation of the exotic by convincing the surrounding Ryots of the much greater profit obtainable from growing the "new" cotton, after which all that will be required, to give it permanency, will be European merchants specifying that as the kind of cotton they wish to purchase. This course is now being pursued here with much effect, there being many more native growers this year than any former one.

(Signed) R. Wight, Surgeon.
Supt. Cotton Farms.

Coimbatore,
21*st September*, 1850.

No. 1122.

From C. J. Bird, Esq. Acting Collector.
To Surgeon R. Wight, Superintendent of Cotton Farms, Coimbatore.

Sir,—With reference to para 2 of Extract from Minutes of Consultation under date the 12th September 1849 and para 9 of that under date 22nd October 1849, I have the honor to report through you for the information of Government that Proclamation was published and every means used to advertize the Ryots and dealers concerned about cotton that the Government Gins and Machinery for cleaning cotton were available for their use, Mr. Cuxton, in charge of the Gin House was also made acquainted with the orders passed by Government in June 1849 on the subject.

2. It will however be seen from Mr. Cuxton's letter* dated the 30th Ultimo that the Ryots and dealers have not in the course of the past season availed themselves of the permission held out to them to use the foreign Machinery.

* Copy enclosed.

(Signed) C. J. Bird,
Acting Collector.

Coimbatore,
4*th September* 1850.

To C. J. Bird, Esq. Acting Collector of Tinnevelly.

Sir,—In reply to Memo. of date 27th August I beg to say that the Government Gins have not up to this time been called into use by either dealers or cultivators about here.

I took every opportunity some time back of informing both cultivators and dealers in Cotton that the Government Cotton Gins were at their service if they chose to have their cotton cleaned by them and moreover that this would be done for them free of charge for the use of the Machines.

This information I observed at the time did not at all take with them and one of the chief reasons for its being so was, as they said, "that they could not find a market for Ginned cotton." "They could not tell whether they could sell such cotton to the Merchants at Tutacorin with whom they chiefly deal." I advised them to make enquiry on the subject but they seem not to have troubled themselves any further with the matter. The Gins at present employed in cleaning cotton on account of Government are the small Gins (2 of 25 saws each and one of 20 saws) which are worked by Coolies at the rate of 8 men to a Gin.

(Signed) R. M. Cuxton.
In charge of the Gin House Sevacassi.
(True Copy.)
(Signed) C. J. Bird,
Acting Collector.
(True Copy.)
(Signed) Robert Wight, Surgeon,
Superintendent Cotton Farms.

Gin House Sevacasse,
30*th August* 1850.

No. 972.

Extract from the Minutes of Consultation, under date 18th October 1850,

Read the following letter from Surgeon R. Wight, Superintendent Cotton Farms Coimbatore.

(*Here enter* 21*st September*, 1850.)

1 The Right Honorable the Governor in Council regrets to learn from Dr. Wight's communication that the people of the Tinnevelly District have shewn a reluctance to avail themselves of the advantage offered by Government of having their Cotton cleaned at the Gin House free of charge. From the circumstances represented, it does not seem likely that the disinclination of the people will be soon or easily overcome and it is therefore desirable that Dr. Wight should report whether there will be

any utility in longer keeping up the Gin establishment in the Tinnevelly District on its present scale and whether the Gins may not be more profitably employed elsewhere.

2. The Government would wish to be furnished at the proper time with a general report on the Cotton experiments in the Tinnevelly District, the extent and results of Mr. Cuxton's operations there, and a connected view of the whole farming establishment in all its branches, with any suggestions that may occur to Dr. Wight for its extension or improvements.

3. The Government resolve to take an early opportunity of bringing Dr. Wight's communication to the notice of the Honorable Court of Directors.

(Signed) T. Pycroft,
Secretary to Government.

Fort St. George,
18*th October*, 1850.

No. 503.

Extract from the Proceedings of the Board of Revenue, dated 28th November 1850.

In Con: 28th Nov. 1850.

Read letter from the Collector of Bellary dated the 4th November 1850, forwarding, in consequence of the unfavorable report made by the Chamber of Commerce on the specimen of Native Cotton cleaned with the Dharwar Hand saw Gins and of the doubts expressed by Dr. Wight on their capabilities, copies of correspondence with the Collector and Superintendent of Experimental Cotton farms at Dharwar which in his opinion most satisfactory establishes the value of these machines, four of which have since been received at Bellary.

(*Here enter No.* 66.)

From Bellary 27th June, in Cons: 4th July 1850.
Pro: to Colt. Sea Customs: 4th July 1850.
From do. 27th July, in Con: 15th April 1850.

Resolved that the letter above recorded together with its enclosures and the previous correspondence noted in the margin be submitted for the information of Government with reference to para. 6 of Extract Minutes of Consultation 5th June 1850.

(A true Extract)
(Signed) W. H. Bayley,
Secretary.

No. 66.

From C. Pelly, Esq. Collector of Bellary.
To W. H. Bayley, Esq. Secretary to the Board of Revenue, Fort Saint George.

Sir,—In consequence of somewhat unfavorable report made by the Chamber of Commerce on the specimen of native cotton cleaned by the Dharwar Hand saw Gin as reported in the papers which accompanied the Board Proceedings under date the 15th August 1850, and in consequence of the doubts entertained by Dr. Wight respecting the capabilities of these machines, I wrote to the authorities at Dharwar on the subject, and now have the honor to forward copy of that correspondence, which is most satisfactory, as establishing, I trust, the value of this new machine, four more of which have been since received at Bellary.

(Signed) C. Pelly, *Collector.*

Bellary Collector's Office,
4*th November*, 1850.

No. 266 of 1850.

To the Collector of Bellary.

Extract from the Minutes of Cons. No. 554 dated 5th June 1850.
Letter No. 296 of 1850 from the Collector of Cuddapah to the Collector of Dharwar.
Endorsement No. 1220 of 1850 from the Collector of Dharwar to the Supt. of cotton Experit. Dharwar District.

Sir,—In reference to the communication quoted in the margin in which I am directed to forward you five cotton Gins of 7 saws each, I beg to enquire if five gins in addition to those I sent you some time since are required. I have the honor to inform you that we have made some alterations and improvements on the small Gin which render them more portable and convenient and by which a large amount of cotton is cleaned per diem, one of them is now at work at the Village of Hooblee in this district, the owner of it has written to me that it cleans, per diem 20 maunds of (26lb.) New Orleans and 28 do. of Native cotton.

2. The cost of the machines is Rupees 50 each. Should you wish to have some of them I shall have much pleasure in supplying you.

(Signed) J. M. Blount,
Superint. of Cotton Expt.
A true copy
(Signed) C. Pelly, *Collector.*

Dharwar,
26*th August* 1850.

No. 611.

From C. Pelly, Esq. Collector of Bellary.
To J. M. Blount, Esq. Superintendent of Cotton Experiment, Dharwar.

Sir,—I have the honor to acknowledge the receipt of your letter of the 26th Ultimo offering to supply me with the improved Gins each containing 7 saws, and to request you will be pleased to forward at your earliest convenience 4 of these gins to Bellary. I request you will be particular in sending Gins adapted to the Native cotton, because I learn from Madras that the Native cotton cleaned by the gins last sent by you was so torn in the staple that the Chamber of Commerce could not value it and considered it as fit only for Wadding. This is a very serious evil and one to which I must draw your particular attention in order that a remedy may be adopted.

Much saving especially in carriage would be effected if the rough frame work of the machines were omitted; the same could be made at Bellary. If you see no objection to this I should be obliged by your sending 1 machine completed and 3 with

out the frame work and all might then be packed on one cart.

(Signed) C. Pelly, *Collector.*

No. 614.

From C. Pelly, Esq.

Collector of Bellary.

To W. W. Bell, Esq.

Collector of Dharwar.

Sir,—Two parcels of Native Cotton, the one being cleaned with the saw gin supplied to me by Mr. Blount Superintendent of Cotton Experiments in your District and the other worked with the common churka in use in the country were forwarded by me to the Board of Revenue, and sent by them to the Committee of the Chamber of Commerce at Madras for the purpose of ascertaining the respective value of the two specimens. The Committee of the Chamber of Commerce do not think that the cotton cleaned with the Dharwar hand Gin superior to that cleaned with the Native Churka. They also state that it is so much torn in the staple as to be in their opinion fit only for Wadding and that it would be necessary to submit it to the manufacturers in England to ascertain its value. Under these circumstances, I have the honor to request you will be pleased to let me know whether in Dharwar there is or not any difference made as respect quality and value between the Native Cotton cleaned by the Gin and that cleaned by the Churka: you will also oblige me at the same time by favouring me with the specimen of your District Cotton similarly cleaned with the two machines, and their respective value in the market. The evil alluded to in the cleaning by the Dharwar Gin has not I presume been experienced by you or noticed at Bombay but perhaps you can inform me whether it may be attributed to any defect in the Saw Gin, or to any mismanagement in the using the machine or to the Gin not being adopted to the Cotton in question. I beg to send a small parcel of the Bellary Native Cotton for inspection as also some of the same kind cleaned with the Dharwar Gin; as I have written to Mr. Blount for 4 more Gins, I trust every care will be taken to prevent any defect that may prove ruinous to the experiment.

I have on this occasion the honor also to enclose copy of a letter from Dr. Wight Superintendent of Cotton Farm at Coimbatore to the Secretary to the Board of Revenue Madras, dated 4th July respecting the working of the Dharwar Cotton Gin, you will observe that he is sceptical as respects the quantity they are supposed to clean daily. I would request your particular attention to this point and beg you will favour me with your view of the matter. The trial made at Bellary with the Dharwar saw gin resulted in cleaning 50 lbs. per hour and at 8 hours per diem would be 400 lbs. of Cotton with the seed Kuppas or Puttee.

(Signed) C. Pelly, *Collector.*

No. 1661 of 1850.

To C. Pelly, Esq., *Collector of Bellary,*

Sir.—I had the honor to receive your letter, No. 614, dated 7th instant in due course, but the specimens of Cotton reached me only this morning.

2nd. I can perceive no difference between the seed Cotton and that which has been saw ginned. The fibre of the latter is not in the least broken, as you will perceive if you will compare the two small specimens which I enclose. They have been simply repeatedly pulled between the fingers to straighten the fibre, one was pulled from the seed by the fingers and the other is the saw ginned Cotton which you sent me. I have sent the parcels to Mr. Blount and will forward his opinion of the specimens to you.

3rd. The belief that the Fibre of Cotton is torn in the saw gin is a curious fallacy long since exploded in America and always considered absurd, I believe, by the manufacturers in England. In fact it is a moral impossibility that the fibre can be torn by the gin unless the saws have become displaced and touch the grates. To a person unacquainted with the subject saw ginned Cotton will always appear on being pulled between the fingers to be irregular. This is caused by the Brush of the saw gin which as you are aware removes the Cotton from the saws and propels it from the machine, by which operation the fibres are laid crosswise, so that when pulled between the fingers a small portion only is stretched to its full length.

4th. There is no difference here, in the value of Cotton cleaned by the foot roller (the churka is not used) and that which is saw ginned. In quantity the latter is considered by those who have dealings with Bombay to be superior, for the dirt is removed by saw ginning and the leaf only left, whereas the foot roller does not separate the dirt.

5th. The opinion of the Chambers of Commerce should not be permitted to condemn any result of an experiment in cotton, for it is beyond dispute that the value placed by merchants in this country upon cotton is very incorrect. Some years ago a quantity of New Orleans cotton grown in Dharwar was bought in Bombay for 115 Rupees per candy and a quantity of indigenous Candish cotton for 132 Rs. per candy. In England the former was sold for 7 ℔ ℔, the latter for $3\frac{1}{2}$ ℔ ℔.

6th. I have sent you a parcel of native cotton cleaned here by the foot roller, and one cleaned by the saw gin as you request.

7th. Mr. Blount will send you in a day or two four saw gins made in the factory of our Experiment on an improved principle. Dr. Wight may be sceptical of the capability of these little machines

I can only assure him, that I saw the first of the kind now being made for you tried, and it cleaned with two men at the wheel, and one feeding 56 lbs. of seed cotton in 45 minutes. A merchant at Hooblee who bought some of the same description of gins, has written to me, that he can clean 28 maunds of country seed cotton and 20, of New Orleans, with one of them in a day, the maund being 28 lb.

8th. The improvement effected in these gins is, that the Driving wheel is proportionately far less heavy than that required for the large gins, and the brush being propelled by a friction roller, revolves more easily and far more rapidly than when it is turned by a band. There is no question of the superiority of the small seven saw gins in every respect: they are cheaper, they perform more work in proportion, they are more easily repaired, and do not involve the same loss by cessation of work for repair which large gins do (for in their case seven saws are stopped, in the other the whole number perhaps sixty, become inoperative) and lastly they can be used in any corner of a native's house, or in the open air.

(Signed) W. W. BELL, *Collector*.
(A true Copy.)
(Signed) C. PELLY, *Collector*.

Collector's Office, Dharwar, 24th September 1850.

No. 175 of 1850.

To W. W. BELL, Esq.
Collector, Dharwar.

SIR,—In acknowledging the communication noted in the margin under cover of your letter No. 1605 of 1850, I have the honor to state in reply to the letter from the Collector of Bellary, that the action of the cotton gin in cleaning up laid or short staple cotton does not injure the fibre more than other description of machines used for separating the cotton wool from the seed. The superiority of the gin over the churkey consists in its making a cleaner cotton that is free of leaf dirt and seeds and perform a given quantity of work at a much less cost than any other process known.

Letter No 614 of 1850 from the Collector of Bellary to the Collector of Dharwar dated 7th Sept. 1850. Letter from Dr. Wight Superintendent of Cotton Farms at Coimbatore to the Secretary to Government Fort St. George, dated 4th July 1850.

Letter from Dr. Wight Superintendent of Cotton Farms at Coimbatore to the Collector of Bellary dated 5th July 1850.

2nd. In this District I have heard of no sales of saw ginned Native cotton, but in Bombay it is considered worth from 5 to 10 Rupees the candy more than the foot rolled cotton. I have often examined the saw ginned Cotton and compared it with fibre pulled of the seed by hand and the difference in length is not perceptable, and if the cotton is so badly cut as reported by the chamber of commerce, it must be owing to mismanagement of the gin not to any fault in its construction.

3. I have as requested forwarded two samples of Native cotton, one cleaned by the gin, the other by the foot roller: they were procured from a dealer at Hooblee and are fair samples.

4. In answer to the doubts expressed in the letter from Dr. Wight regarding the quantity of cotton cleaned on by the gin in this District, I have the honor to state that there is between 70 or 80 Gins at work in this District belonging to private parties. I cannot state the quantity cleaned on each machine, but those containing 14 to 20 saws clean from 700 to 900 lbs. of euppas per diem according to the number of hours worked, the small gins of 7 saws (8 inches diameter) will clean from 350 to 400 lbs. and the improved gin of 7 saws 10 inches diameter 520 lbs, easily in 8 to 9 hours: the foregoing rates are all for native cotton, none of the gins will clean the same weight of American cotton in a day's work as a native.

5. I have a few gins at work on Government account and they clean per diem as follows:

18 saws 8 men at 2 As. each native 35 maunds of 28 lbs 980.

18 do. 8 do. 2 ,, do. American 30 do. lbs 28 840.

(Signed) J M. BLOUNT.
Supt. of Cotton Expt.
(A true Copy.)
(Signed) C. PELLY,
Collector.

DHARWAR, 19*th Sept.* 1850.

Extract from a letter from the Superintendent of Cotton Experiment to the Collector of Bellary dated 17th September 1850.

4. I will dispatch you the four small Gins in a few days, I think you had best have them complete as a man unacquainted with their mechanism will not be able to make up the frames correctly; we have made such improvement and modification on them lately as make them more portable and I think I shall be able to get the whole on one cart. The price of the Gins is ten Rupees each above those I first sent you—which is more than compensated for in the workmanship and larger amount of work it can perform. In a day's work, say 8 or 9 hours, each Gin will clean 520 lbs. of Native Cappas with three men. As much as 728 and 520 lbs. of Native and American respectively has been cleaned on one in 9 hours.

(Signed) J. M. BLOUNT,
Superint. of Cotton Expt.
(A true Extract.)
(Signed) C. PELLY, *Collector*.

No. 1203.

Ordered that the correspondence received with the above Extract be communicated to Dr. Wight.

(Signed) T. PYCROFT,
Secretary to Government.

FORT ST. GEORGE, 17th December 1850.

Coimbatore, 9th *January* 1851.

From Surgeon R. Wight, Superintendent Cotton Farms, Coimbatore.

To T. Pycroft Esq., Secretary to Government, Fort St. George.

Sir,—I have the honor to acknowledge the receipt of Minutes of Consultation No. 1203 under date 17th December 1850, transmitting copies of correspondence regarding the capabilities of the Dharwar Cotton Gin.

Since their receipt I have received one of the Gins and have subjected it to a moderate trial. It was worked two days 8 hours each day, the result, I regret to add, has confirmed the doubts expressed in my letter of the 4th July 1850. So unsatisfactory indeed has this been, that I almost hesitate placing it on record, after the high encomiums bestowed on these machines by the Dharwar authorities, fearing that they may repudiate my statements as being the onesided testimony of a prejudiced witness resolved to find fault. If however such a thought crosses their minds I can most truly and conscientiously assure them they are in error.

The Gin arrived on the 31st December and on the 2nd January it was brought into use. On that day the outturn of 8 hours very constant work was 200 lbs of Kuppas cleaned. On the 3rd, only the same quantity was cleaned. On the first day I paid somewhat less attention to the trial, as three well known and most steady men had been selected to make it, men who had for many months back been employed in working our gins and therefore well trained to that kind of work. On the second day I was most assiduous in my attendance, being present with them the greater part of the day, and can speak confidentially of their unremitting assiduity which was further stimulated by the knowledge that they were to be paid by contract for the work done not by daily hire.

Under ordinary circumstances I should perhaps have deemed it sufficient to report the circumstances to Mr. Pelly for the information of Messrs. Bell and Blount, but as their correspondence has been forwarded through Government I feel constrained, however unwillingly to trouble the Right Honorable the Governor in Council with my remarks, the subject moreover is an important one.

In my letter of the 4th July 1850 I ventured to express a doubt of the correctness of the report of the capabilities of the Dharwar Gin but still thought it must be very superior to ours and therefore solicited permission to get one to serve as a model by which to improve ours. Permission being granted one was applied for and obtained.

In the interval a copy of my letter was sent to Mr. Pelly and communicated to Messrs. Bell and Blount both of whom seem to feel I had almost said, displeased with me for hesitating to receive their report, which they emphatically reiterate, adducing in support of it what seemed to me irrefragable proofs of its correctness. Under these circumstances I waited impatiently for their gin and actually stopped improvements I was making on our gins, under the conviction that they must still fall greatly short of the Dharwar model, though improved, in their working qualities, to the extent of from 40 to 45 per cent over the American model on which they were originally constructed. A 5 saw-gin (to be afterwards mentioned) for example, which under the original American construction cleaned 25 lbs. of Kuppas in an hour, afterwards on the new construction cleaned 30 lbs. in 45 minutes, thus gaining 25 per cent in time and 20 in work done.

The gin sent, possibly a very bad one, has not merely confirmed my former scepticism, it has done more, it has convinced me that with a mechanism so faulty it is incapable of sustaining a single week's work, and so far from cleaning 520 or 750 lbs. a day for a succession of days, I question if it is capable of cleaning 5,000 lbs. altogether without renewal of some parts of its driving machinery, and as regards its working capabilities I can only say that in place of 50 or 55 lbs. in 45 minutes it barely gave an average of 25 lbs. per hour during the 16 hours it was worked here.

On this subject Mr. Bell writes, "Mr. Blount will send you in a day or two four Saw Gins made in the factory of our Experiment on an improved principle. Dr. Wight may be sceptical of the capability of these little machines, I can only assure him that I saw the first of the kind, now being made for you, tried and it cleaned with two men at the wheel and one feeding 56 lbs. of seed cotton in 45 minutes. A merchant at Hooblie who bought some of the same description of Gins, has written to me that he can clean 28 maunds of country seed Cotton and 20 of New Orleans with one of them in a day the maund being 28 lbs. (that is respectively 784 and 560 lbs. per diem) Mr. Blount says the small gins of 7 saws (8 inches in diameter) will clean 350 to 400 lbs. and the improved gin of 7 saws, 10 inches diameter, 520 easily in 8 or 9 hours. The foregoing rates are all for native Cotton none of the gins will clean the same weight of American Cotton in a day's work as of Native."

In another letter he says, "The price of the Gins is 10 Rupees each above those I first sent you which is more than compensated for in the workmanship and larger amount of work it can perform. In a day's work, say 8 or 9 hours, each gin will clean 520 lbs. of Native Kuppas with 3 men. As much as 728 and 520 lbs. of Native and American respectively has been cleaned on one in 9 hours."

As regards the construction Mr Bell writes, "The improvement effected in these gins is, that the driving which is proportionately far less heavy than that required for the large gins, and the brush

being propelled by a friction roller revolves more easily and far more rapidly than when it is turned by a band. There is no question of the superiority of the small 7 Saw Gins in every respect &c."

The above noted trials were made on the 2nd and 3rd Instant (Thursday and Friday) and on the 5th I was about to renew them but found the machine useless, the brush having ceased to act, and on closer examination I found that it was already virtually a worked out machine, as, unless I had had the means of renewing the brush machinery, it could not have ginned another pound of Cotton.

To a person unacquainted with the machine it is not easy to explain how this happened, but I trust with the aid of the accompanying diagrams to make this plain. The Diagram No. 1 is a plan of the working mechanism of the Coimbatore Gin, No. 2 that of the Dharwar Gin.

In No. 1 the circle marked S. C. is the end of the saw cylinder to which motion is conveyed from the driving wheel which moves all the rest. It turns from left to right. B is the end of the brush shaft which is turned from right to left by means of the band passing round the outer larger rim of the Cylinder-pulley and the Pulley marked P. The brush must turn in the opposite direction to the saws to sweep off the cotton from their teeth and at the same time act as a fanner to propel it into the "Lint room." To effect this double object it is made to revolve from 4 to 5 times for one revolution of the Cylinder hence the small size of its pulley. In our Gins the driving wheel is so adjusted that for each of its revolutions the Cylinder revolves about four times, and as in average driving it turns about 45 times the Cylinder must revolve about 180 times per minute. This we think ample speed perhaps too high, probably 140 would be better as being less likely to injure the Cotton.

Tha mechanism of the Dharwar gin is different, the object of which is to get rid of the brush band and turn the brush by friction on the supposition that is an improvement. To accomplish that the rim of the Cylender-pulley is greatly enlarged so as to touch that of the brush. In the Diagram No. 2 the circle S. C. again represents the Cylender-pully, the outer one F. R. represents the large rim and B. the brush-pulley. C. L is a Crank-Lever, one end of which is loaded to make the other act on the end of the brush shaft behind the pulley as indicated by the dotted lines The object of this arrangement is to keep the friction Rollers in steady contact and by allowing some play to the brush shaft compensate for any slight inequalities of the surface of the friction Rollers. As in our gin, the brush revolves about four times for each revolution of the Cylinder: but the diameter of the Cylinder pulley being much less than ours (in the proportion of 6 to 10) it revolves about $6\frac{1}{4}$ times for each revolution of the driving wheel giving a speed of about 280 revolutions of the saw per minute.

Regarding the principle of conveying motion to the brush by means of friction Rollers I am not mechanic enough to venture an opinion, but as regards the material of which they are composed, and the mode of constructing them, at least in the one sent here, I can have no hesitation in pointedly condemning both. The large friction roller 18 inches in diameter is made of a simple piece of plank and that in ours of apparently, unseasoned wood without the precaution of making it of two layers with the grain crossing to obviate literal shrinking. The consequence is, that within a week from its first exposure to the dry atmosphere of Coimbatore it had shrunk so much that the friction rollers only touched at the ends of a few of the fibres of the wood, while literally they did not approach within $\frac{2}{10}$ of an inch of each other, and at this time the transverse diameter, that is across the grain of the wood, is less by fully $\frac{3}{8}$ of an inch than the longitudinal. It is therefore no longer a circle.

The principle as worked out in this gin is open to another grave objection. During the two days work the Crank-lever though often oiled was worn to the depth of $\frac{1}{4}$ of an inch and the brush shaft to the depth of $\frac{1}{10}$ all round, at which rate three more such days would have cut through the Crank which is $\frac{5}{8}$ of an inch broad and half divided the shaft on which it acted. Full sized sketches of both are given in the Diagram. Very careful oiling might to some extent have obviated so much wear but could not materially prevent it, the friction being so very great.

Such being the defects of the mechanism employed to carry out this new application of the principle, its total failure can scarcely excite surprize. When thus disabled I removed the whole and substituted in the place of the friction rollers a driving machinery removed from one of our gins and then proceeded to test its capabilities as compared with the new Coimbatore model.

But before doing so I may advert to the fact that Mr. Bell distinctly states that he " saw one of these 7 Saw Gins clean 56 lbs of seed Cotton in 45 minutes." I cannot venture even to hint a question as to the perfect correctness of a statement so circumstantially made, but, assuming it to be literally correct, I trust I may be permitted to observe that I think it says little to the credit of Mr H. Frost the maker to send out from his factory machines bearing so high a character untried and so very defective as I have found the one sent here.

I have just stated that I removed the friction rollers and adapted to the Dharwar Gin the mechanism of one of ours thus so far placing it exactly on a par with our Gins. Then proceeded to try its capabilities as compared with a five saw gin built about 3 years ago for location on a distant farm. That gin as originally constructed on the American

model generally cleaned about 25 lbs in the hour now it is capable of cleaning 30 lbs in 45 minutes when the driving coolies are fresh and work steadily. The Dharwar gin working side by side and most steadily driven required 52 minutes to clean the same quantity. That trial not being considered conclusive owing to some irregularities at first starting from the bands slipping, they were allowed to go on working between two and three hours until they had become perfectly steady when each was furnished with 100 lbs of Native Cotton and a fresh start given, the only difference being that the Coolies were changed to make sure that the slower performance of the morning did not originate with any inferiority of the drivers.

The 5 saws cleaned their 100 lbs in 168 minutes.

The 7 Saws required 189 to complete theirs being a difference if I have not miscalculated Saw for Saw of about 55 per cent. This I trust will be held conclusive as to the superior merits of the Coimbatore Gin as a working machine.

One other point remains to be very briefly noticed, it relates to the way they respectively finish their work. While the experiment was going on, it was noticed that the Coimbatore Gin cleaned the seed better than the other. After it was over the two parcels of seed were weighed against each other, and the difference in favor of ours found to amount to 5 per cent. that is, the seed of 100 lbs of Kuppas, cleaned by the Coimbatore Gin, was 5 lbs lighter than that from the Dharwar Gin, owing to the latter having 5 lbs more Cotton attached to them. It thence appears that, could the gin sent here be viewed as an average one, ours is in every way superior. It works 50 per cent faster, and does its work better.

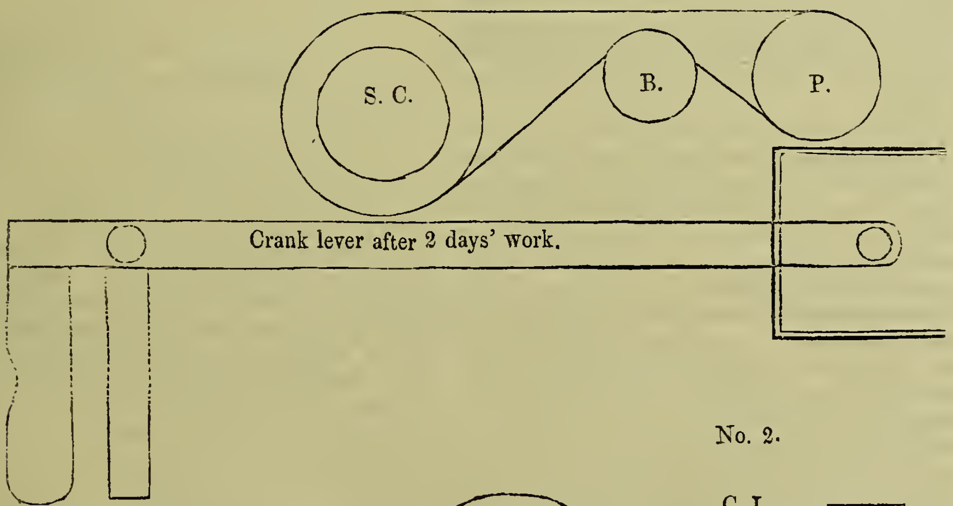
One question in regard to gins still remains to be solved it respects the speed at which they should be driven but this is an enquiry of great delicacy and many careful experiments will be required for its solution. It must therefore stand over for the present.

Apologising for the length of this letter and trusting that my remarks, which are not written in a controversial spirit and simply record facts may have the effect of leading to further improvements of the cotton Gin.

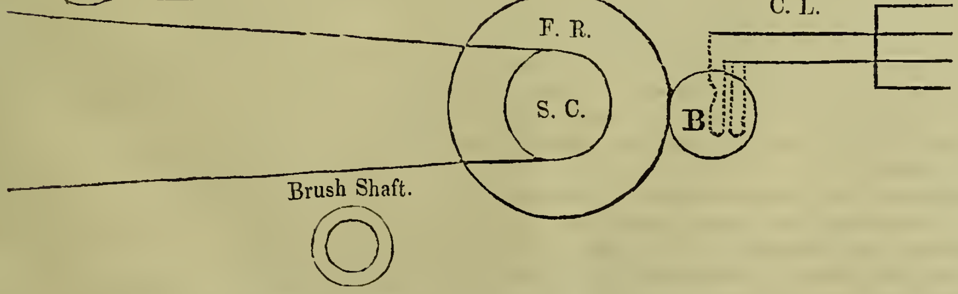
(Signed) R. Wight, Surgeon,
Supt. Cotton Farms.

Coimbatore, }
9th January 1851.}

No. 1.



No. 2.



Inner circle depth of groove worn in 2 days' working.

No. 144.

Extract from the Minutes of Consultation, under date the 11th February 1851.

Read the following letter from the Superintendent of Cotton Farms Coimbatore.

(*Here enter 9th January* 1851.)

Ordered that the foregoing letter from the Superintendent of Cotton Farms be communicated to the Board of Revenue in reference to the correspondence submitted with the Extract from their Proceedings of 28th November 1850 and that they be instructed to furnish copies of Dr. Wight's letter to the Collectors of Bellary and Cuddapah and to call upon them for a report upon the use which they have made of the Dharwar Cotton Gins which they were authorized to procure by Extract Minutes of Consultation of 5th January 1850 and upon the results of the working of these Gins in their Districts.

(Signed) T. PYCROFT, *Secy. to Govt.*

From Surgeon R. WIGHT, Superintendent Cotton Farms, Coimbatore.

To T. PYCROFT, Esq. Secretary to Government, Fort St. George.

SIR,—Subjoined I have the honor to transmit Memorandum of the disposal of the Cottage Cotton Gins which have come to this Establishment which, I trust, will be found satisfactory. I also append Copies of Correspondence with the Collector of Tinnevelly which led to the transfer of six to that District.

The natives of this district I am happy to find have been watching with attention and interest the working of these little machines and a dealer has applied to me to let him have the use of some of them to gin a few Candies of Cotton thereby to learn by actual comparison in what respect they are superior to the Churka.

To this request, as being the first decided step taken by a Native to go out of the beaten track, I at once agreed on condition that the trial should be made on our premises. This condition being accepted a shed was fitted up for their reception in which 10 are now at work.

According to our experiment one gin steadily worked by two women can easily clean 100 lbs. of seed Cotton per day. At the average rate of working about 8 Churkas will be required to do the same amount of work in the same time. These 10 Gins and 20 drivers, therefore, are equal to about 80 Churkas with the further advantage that they take up but little more room in a Cottage than a Churka.

Should this trial prove satisfactory to the merchant, it is my belief the Cottage gin will soon be extensively used in this district, time being an item of so great importance in Commercial transactions.

One obstacle however remains to be got over. I allude to the impression among merchants in India that the gin cuts the fibre of the Cotton. There can scarcely be a doubt of its being founded on error, and keeps its ground simply because they do not know how to examine ginned Cotton. The most convincing proof that I can adduce in opposition is the fact, that ginned Cotton of similar quality uniformly realizes from $\frac{3}{8}$d to $\frac{1}{2}$d per pound higher prices, than when Churked, in the English market.

(Signed) ROBERT WIGHT, Surgeon,
Supt. Cotton Farms.

COIMBATORE, 12th February.

Memorandum of the disposal of Cottage Cotton Gins.

Received,... ...		40
Sent to the Chamber of Commerce, ...	1	
Sent to E. B. Thomas, Esq. Act. Prinl. Collector of Coimbatore, ...	2	
Sold to Funre de Faud Clair, Esq. of Dindigul, ...	2	
Sold to Lieut. Chauncey, ...	1	
Sold to Captain Onslow, Mysore Government, ...	2	
Sent to the Collector of Cuddapah, ...	6	
Sent to the Collector of Bellary, ...	6	
Transferred to C. J. Bird, Esq. Acting Collector of Tinnevelly, ...	6	
		—26
Remaining...		14

(Signed) ROBERT WIGHT, Surgeon,
Supt. Cotton Farms.

No. 118.

From C. J. BIRD, Esq. Acting Collector.

To Surgeon R. WIGHT, Superintendent Cotton Farms, Coimbatore.

SIR,—I have the honor to inform you that I have disposed of the three iron and one wooden Cottage saw Gins which were received from Government in April last. Two of the iron Gins were taken by Mr J. McTaggart of Tutacorin for 30 Rupees each. The 3rd iron Gin was sold to Mr. Brown of Tutacorin for 30 Rupees. The wooden Gin was disposed of also to Mr. Brown, but as I do not know the price fixed for the wooden Gin, I request you will be good enough to instruct me how much I ought to take for it. I beg also to know in what way and at what prices the extra brushes &c., furnished with the Gins should be distributed to the purchasers.

Spare saw..............	2
Brushes................	10
Bands cotton and wrenches..........	2
Iron..............	2

I have had applications from Mr. McTaggart for one or two more of these Gins and Mr. David Lees who is growing American Cotton largely in this district requests me to procure for him five of the iron Cottage saw Gins.

I beg therefore to suggest that the three iron and one wooden cottage Gins now at Sevacassy may be

offered for sale, but as one or two of them arrived in a damaged state an abatement should be made in the price, also that a further supply of at least 2 sets each consisting of 3 iron and 1 wooden Cottage Saw Gins may be sent to me for distribution.

(Signed) C. J BIRD,
Acting Collector.

Tinnevelly Trichendoor,
25th January 1851.

From Surgeon R. WIGHT, Superintendent Cotton Farms, Coimbatore.
To C. J. BIRD, Esq. Acting Collector Tinnevelly.

From Surgeon R. Wight to the Secretary to Government Fort St. George dated 25th March 1850.
Extract Minutes of Consultation dated 22nd April 1850.

Sir,—I have the honor to acknowledge the receipt of your letter of the 25th ultimo and in reply enclose Copies of Correspondence regarding the price of the Cottage Gins from which you will perceive no latitude is allowed to me.

With respect to those at Sevacassy there seems no absolute objection why they should not be transferred to you, but as they may require to be replaced and as I am enabled to supply you with Gins from this Establishment in every respect perfect and whose qualities, as it occurs to me, that the more advisable course will be to transfer six or eight of them (one Bandy load) to your district to be disposed of as opportunities offer.

	No.
Spare Saws	2
Brushes.	10
Cotton bands	2
Wrenches.	2

With regard to the spare articles, I find from a Memo in my Office that only those enumerated in the margin accompanied each set of 4 Gins which as regards wrenches is clearly insufficent, for unless they were ordered to be sold in sets, one ought to accompany each Gin. I shall therefore get some made and attach one to each of those I am about to send, I shall also get some more spare bands prepared as there is a person here who makes them very well, and without splice. Spare brushes I cannot supply for want of bristles which I can rarely procure when procurable, there are persons here who can make them up.

A cart conveying six iron and perhaps, one wooden gin will be dispatched about the middle of next week.

(Signed) R. WIGHT, Surgeon,
Supt. Cotton Farms.

COIMBATORE,
1*st February* 1851.

Ordered that the foregoing letter be recorded.

Revenue Board Office, Fort St. George, 27*th Nov.* 1851.

No. 512.

From W. H. BAYLEY, Esq., Secretary to the Board of Revenue.
To Sir H. C. MONTGOMERY, Bart. Chief Secretary to Government.

Sir,—I am directed by the Board of Revenue to acknowledge the receipt of Extract Minutes of Consultation 11th February 1851, enclosing copy of a communication from Dr. Wight, the Superintendent of Cotton Farms, contrasting the working of the Dharwar Cotton Saw Gins with the more favourable operation of those of Coimbatore, and directing the Board to furnish copies of that report to the Collectors of Cuddapah and Bellary, and to call upon them to state the use made of the Dharwar Cotton Gins which they had been previously authorized to procure, and the results of their working in their respective Districts.

From Cuddapah 23rd July in Cons 27th Nov. 1851, Bellary 18th Oct. in Cons. 27th Nov. 1851.

2. In reply I am directed to submit the replies of those officers to the reference made to them upon the subject.

3. In Cudpapah, six Iron Cotton Gins were procured from Coimbatore and Five Wooden ones from Dharwar, two of each were sent to the Talooks of Jummulmudoogoo and Koilgoontla, and the remainder retained in the Collector's Cutcherry. The Acting Collector, during the late Settlement, took measures publicly to show the working of those in the two Talooks mentioned, and offered to comply with any requisitions for them ; and Mr. Forbes has himself also exhibited the working of the Gins in his Cutcherry, to Cotton Merchants, Ryots and others, and explained to them that the higher price they would obtain for better cleaned Cotton would counterbalance any outlay in the purchase of the Gins.

4. The inhabitants are however stated to be averse to the introduction of the Gins. 1st, On account of the extra expence they would be put to. 2dly, Because the Gins tear the fitre and render it useless for weaving, which is not so much the case with the use of the Churka ; and 3dly, Because the Gins do not clean the Cotton wool off the seeds so perfectly as the Churka, but leave it adhering to the seed which their cattle will not, in that case, eat.

5. Mr. Forbes is of opinion that until some Capitalist settles on the spot to give the Ryots a practical proof that well cleaned Cotton will bring a higher price than the dirtier sort, and so induce them to feel that their interests are at stake, there is no prospect of substituting the Gin for the Churka generally throughout the District.

6. The Collector of Bellary attributes the failure of the experiment in his District partly to the want of co-operation on the part of the Ryots, but chiefly to their ignorance in using the Gin or in repairing it. Previous to the sanction of Government for the Five Dharwar Gins, which he has received but reserved for trial next year for one or two intelligent Ryots, the Collector would appear to have procured some Dharwar Gins for the wealthier Ryots, who paid for them, but who from their want of skill in using them have since been disheartened. Meantime that Officer requests early sanc-

tion for employing two Carpenters for six months, each at 17½ Rupees per mensem, to superintend the working of the Gins in the ensuing year, and to repair them when out of order; being quite satisfied that the experiment will be attended with successful results if the Gins are placed in proper hands, and that they will yield a net saving of 25 or 30 per cent. Mr. Pelly encloses copies of letters from the Collector of Dharwar and the Superintendent of the Gin Factory there, on the subject of these Gins, in which it is suggested that he should apply for an Apprentice from the Factory to train up persons to repair the Gins when out of order; on this point Mr. Pelly promises to address the Board if necessary.

7. The Board regret to notice the unfavourable results which have hitherto attended the operation of the Dharwar Gins in both the Districts of Cuddapah and Bellary, but are unwilling to abandon the experiment without giving it every reasonable trial. They therefore support Mr. Pelly's application for a further trial for one year, and for his employing the two carpenters for six months at a cost not exceeding Rs. 210-0-0, and would suggest that the Gins in Cuddapah be retained, pending the issue of the further trial in Bellary.

(Signed) W. H. BAYLEY, *Secretary.*

Revenue Board Office,
Fort St. George,
27th November 1851

From Cuddapah Collector's Office.
23rd July 1851.

No. 73.

From H. FORBES, ESQ., Collector of Cuddapah.
To W. H. BAYLEY, ESQ., Secretary to the Board of Revenue, Fort St. George.

Sir,—1. I have the honor to reply to the Extract from the Proceedings of the Board of Revenue, dated the 27th February 1851.

2. Six iron cottage saw gins have been received in this district from Coimbatore, and five wooden gins from Dharwar,—two of each kind have been sent to each of the two Talooks of Jummulmudoogoo, and Koilgoontla, and the rest are in the Cuddapah Cutcherry.

3. During the late settlement in each of the two Tolooks above mentioned, the Acting Collector took the opportunity of all the Ryots being collected, to show them the working of the gins, and offered to obtain any number of either sort for their use, if they expressed their willingness to have them, and to pay for them they were also subsequently shown to all the people at the Talook Cutcherry.

4. I cannot learn that any disposition was shown by the Ryots to avail themselves of this offer, and on the contrary, they appear to have been averse to the introduction of the new machines, objecting to the heavy extra expence they would be put to in working them.

5. Since I have been at Cuddapah I have personally shown the gins now in the Cutcherry to cotton merchants, to ryots, and to others, and endeavoured to explain to them that although the extra labour of working a saw gin may be some drawback to its use, the higher price they would obtain for better cleaned Cotton, would more than counterbalance the loss. Of this however they do not seem to be convinced, and I failed entirely in my endeavour to induce them to give the question a trial.

6. The people further object to the gins that they tear the thread, and render it useless for the weaver, and on comparing the outturn of the saw Gin and the Churka, there appeared some ground for their objections, they also complained that the Gin did not clean the Cotton off the seed nearly so perfectly as the common Churka, from which they said that they lost about one sixth in quantity, and that owing to the mass of Cotton left adhering to the seed, their cattle would not eat it, and that this was therefore an additional source of loss.

7. At present I do not see any prospect of the introduction of the Gin by the mere force of argument, the people are strongly attached to their own ways, and to old customs, and have in the present case some objections to urge, which are practical, and if they stood alone would be sufficient their insufficiency would be shown if any capitalist were on the spot to give the Ryots a practical proof that well cleaned Cotton would bring a higher price than that which was dirty, and until they are thus led to feel that their interests are at stake, although any efforts shall not be relaxed, I am not sanguine of prevailing over prejudice by argument alone.

(Signed) H. FORBES, *Collector.*

CUDDAPAH,
Collector's Office,
23rd July 1851.

Bellary Collector's Office.
18th October 1851.

No. 77.

From C. PELLY, ESQ., Collector of Bellary.
To W. H. BAYLEY, ESQ., Secretary to the Board of Revenue, Fort St. George.

Sir,—In reply to your letter of 9th Instant requesting me to report on the result of the working of the Dharwar Cotton Gins in this District I regret to be obliged to state that the experiment made this year with them has not been successful. But I attribute the want of success partly to the great difficulty always experienced in obtaining the cordial co-operation of the Ryot in any new experiment and partly and chiefly to their not understanding properly how to use the Machine, and to correct any thing when going wrong. I have been in communication with the Collector of Dharwar on the subject, and at his suggestion I have determined to give the Gins another trial during the Cotton season early in next year. And to confine the

experiment to one or two intelligent Ryots and I wish either to procure carpenters from Dharwar to superintend the working of the Gins and to be on the spot to correct any part of the machinery that may get out of order or to employ men hereafter being instructed at Dharwar and I hope the Board for this purpose will be so good as to obtain sanction for the employment of two Carpenters for six months on a salary of 35 Rupees per month for the two, 5 Pagodas each. I am quite satisfied that the Gins will succeed in proper hands as I know that a net saving of from 25 to 30 per cent. may be effected in using these Gins. But they must be introduced very gradually; and the success in the hands of one or two Ryots only must be fully established before attempting to distribute them more generally as done last year and by now adopting this method I hope to be able to send a more favourable report of them next year.

Trusting the very favourable and not exaggerated report of the Dharwar Cotton Gins I had procured several for the more wealthy Ryots who paid for them, but they have from want of skill in using them been disheartened. I have still the 5 sanctioned by Government on hand which I propose next year to give a fair trial to.

I beg to send copy of a letter on the subject of these Gins from the Collector of Dharwar with its enclosure from Mr. Frost the Superintendent of the work at Dharwar. I shall perhaps at a future time take into consideration the propriety of recommending to the Board the employment of one or more of the apprentices mentioned in that correspondence at present the employment of a couple of instructed carpenters to visit all the Gins distributed this year and which failed for want of this assistance is all that is needed for which I request early sanction.

(Signed) C. Pelly, *Collector.*

Dharwar Collector's Office, 13*th November*, 1851.

No. 1551 of 1851.

From J. S. Law, Esq., Collector of Dharwar.
To C. Pelly, Esq., Collector of Bellary.

Sir,—In reply to your communication dated the 28th Ultimo, I have the honor to forward for your consideration the accompanying copy of a letter from the Superintendent of Cotton experiments dated the 8th instant, No. 151.

2. As some of the Districts of your Collectorate appear to be peculiarly well adapted for the cultivation of New Orleans Cotton which cannot be freed from the seed without Saw Gins I think it would be very much to be regretted if the experiments there were discontinued and I trust therefore that you may be disposed to adopt Mr. Blount's suggestion.

3. The Government of Bombay has recently sanctioned the appointment of four apprentices at Rs. 50 per mensem to be placed under Mr. Frost the Mechanic of the Gin Factory here who as soon as they are sufficiently acquainted with the work are to be employed in other Collectorates. Perhaps on your representation the Government of Madras might be induced to sanction the appointment of at least one such apprentice who after being duly instructed here might be stationed in your Collectorate and might be expected in time to train up a body of native workmen capable of making all needful repairs to the Saw Gins.

(Signed) J. S. Law, *Collector.*

No. 151 of 1851.

To J. S. Law, Esq., Collector of Dharwar.

Sir,—With reference to the letter of the Collector of Bellary dated 28th August 1851 received under cover of your endorsements No. 1495 dated 5th September 1851, I regret to learn that the Gins have not been successfully worked and that Mr. Pelly despairs of the successful introduction of these Machines amongst the Ryots in his District.

2. The only difficulty in the way of their introduction appears to be the inability of the Ryots to alter or correct the Machine when going wrong. This difficulty might have been expected with a people so unacquainted with machinery as the Ryots and has often happens in this District but as the people are getting more used to the management of the Gin is not of so frequent occurrences as formerly. I suppose there is some prejudice also existing to the use of the Gin as was the case here, but by a perseverance in the use of the Gin I have no doubt both objections will be overcome.

3. I would therefore propose that Mr. Pelly be requested to give the Gins a further trial as I am confident the Gins will be approved of when seen properly at work.

4. As the Gins are out of order or need repairs I will as soon as the monsoon is over if requested send a workman from this establishment to do whatever is needful and put them to work and to remain there for a month or longer and during that time if a clever workman is put with him he will instruct him how to put up, repair, and work a Gin.

5. I am very anxious that the Gins should have a further trial as I am certain they will be found to answer as well as in this District where there are now owned and worked successfully by the Natives 70 of these small Gins.

(Signed) J. M. Blount, *Supt. of Cotton Expts.*

(True Copy),
(Signed) J. S. Law, *Collector.*
(True Copies),
(Signed) C. Pelly, *Collector*

Dharwar, 8*th September* 1851.

No. 14.

Extract from the Minutes of Consultation under date the 6th January 1852.

Read the following letter from the Secretary to the Board of Revenue.

(Here enter 27th November 1851, *No.* 512.*)*

The Right Honorable the Governor in Council is unwilling to abandon the experiment with the Dharwar Cotton Gins until a further trial shall have been made of them and he is therefore pleased in compliance with the recommendation of the Board of Revenue to sanction Mr. Pelly's proposal for one year, on the positive understanding that the employment shall cease within that time if not resanctioned on fresh reports.

The Governor in Council grants authority for the employment by the Collector of Bellary for the purposes of the above experiment, of two carpenters for six months, at a cost not exceeding Rs. (210) two hundred and ten.

(Signed) T. Pycroft,
Secretary to Government.

Having lately received from China a full sized Cotton Gin, I beg to offer it for the inspection and disposal of the Right Honorable the Governor in Council believing from personal observation that it is well adapted for cleaning Cotton in this country and being on the same principle as the Indian Churka, only modified and improved it would not meet with opposition from the prejudices of the natives.

This machine is so cheap, the price at Shanghai being only 1¼ Rupees, that every Ryot with the smallest holding might have one in his possession.

It is so simple as to be easily constructed or repaired by a common village Carpenter, it is easily worked capable of cleaning 100 lbs. of seed Cotton daily and can be worked inside the house, thus giving employment to the women and children of the Ryot's family and admitting of the cotton being, according to the Chinese practice, cleaned the same morning on which gathered, before the fibres have dried and adhered to the seed, whereby the more easy separation of the seed from the cotton, fibre is ensured and if cleaned by the family of the ryot then on account of the additional trouble in cleaning the cotton, the ryot would probably be more careful when *gathering* the cotton to prevent the admixture of leaves, earth, sticks, &c. and other foreign substances to the great depreciation of our cotton, the value of the article would thus be enhanced to the ryot as the first buyer might then give a higher rate for the article as he would be able to distinguish the cotton which had been well cleaned, and the ryots finding it to their interest to bring perfectly cleaned cotton to market, might probably be induced to cultivate a superior description of cotton, always the Indian Cotton to be really of an inferior kind.

So perfect is the system in China of cleaning Cotton by this simple machine, that in all the hamlets round about Shanghai, in the neighbourhood of which the fine Cotton named Nankin Cotton is extensively grown, and during the Cotton producing season the poorest Chinaman will be seen carrying his Cotton gathered from his own fields cleaned by his own family to the receiving House, opened for the season by the Merchant; there it is at once weighed without the bag containing the cotton being even opened, and the owner then and there paid by a Cheque on a Banker, without any doubt being entertained of the Cotton not being clean. Limited as our trials have been at Madras, yet as several parties have turned the machine, there is no doubt that very little teaching and constant practice will soon render the young girls or boys of a family quite perfect in the use of this machine, and I hope it may supply a great want in our cotton districts, and aid our ryots in improving one of our most important articles of commerce.

(Signed) G. Balfour, *Major.*

Description and Instructions for the use of the Chinese Cotton Gin.

The Gin consists of two rollers, one of Iron and one of hard wood such as, Acho Ebony, Satin, both about 9 or 10 inches in length, the former one inch in diameter; and the latter about three quarters of an inch. The ends of the rollers rest on a wooden stand and they are placed horizontally one above the other, the iron one uppermost, with only sufficient space between to admit of the Cotton fibres passing, and preventing the passage of the seed.

The wooden stand supporting the rollers, is of sufficient height to admit of the machine being easily worked, as is done in China, by a boy or girl sitting on a three legged stool, and is on a sufficiently wide base, and of sufficient weight, to keep it steady when the rollers are in motion.

Attached to one end of the wooden roller is a small crank handle by which the rollers are turned the handle part about three inches, and the Crank six inches long.—At the opposite end of the rollers is a fly bar and the axis on which it turns is a projection about six inches from the iron roller, and at the end of this axis and outside the fly bar is placed small iron ring, to which is attached a string, communicating with a treddle fixed on a moveable joint at the base of the stand, and within four or five inches of the ground.

At each side of the rollers and in the stand there are two small reservoirs, one for receiving the cotton with the seed, before being cleaned, and the other for receiving the cotton when cleaned, and after passing between the rollers; the seed then falling back into the first reservoir and the cotton without the seed into the opposite reservoir.

When the cleaned cotton reservoir becomes full, the cotton is transferred to a bag the mouth of which is always kept closed to prevent the entrance of dust, but the seed reservoir seldom requires emptying during the day's work.

The worker of the machine being seated at the side with his face to the fly bar turns the crank

handle with his right hand, from right to left; whilst with the left he feeds the machine with cotton, and with his left foot on the treddle keeps in motion the fly bar, which revolves in the contrary direction to the handle. The main use of the treddle is to ensure the fly bar revolving in case it should be checked by the rollers being jammed up with cotton, but the foot should be applied to the treddle, as seldom as possible and this is a criterion of the machine being in an efficient working state.

Considerable power over the machine is acquired by standing up to work it; and it admits of frequent changes of hands by shifting from one side of the machine to the other. In order to keep the iron clean nothing more is required than to rub it with Cotton after it has been used, so as to make the iron perfectly bright, but care must be taken to keep it entirely free from rust; otherwise the rust will be liable to entangle the fibre round the rollers.

The chief points to be attended to in the use of the machine are cleanliness in the iron roller and the immediate cleaning of the cotton when gathered.

Some instruction should be given to the ryot before using the machine and one man well taught before distributing the Cotton Gins, otherwise difficulties may be experienced which are not found to exist in China where the machine is in common use in every cottage. Considering that the value of the Cotton sent from India to China is about 250 Lakhs and that an increase to the Madras Trade might be effected if we could supply a better cleaned article for commerce, I hope every endeavour will be used to introduce this simple, cheap and efficient Cotton Gin amongst the ryots of this country, and to give it a fair trial in its present state, either condemning or trying to improve upon it.

(Signed) G. Balfour, *Major*.

No. 481.

Extract from the Minutes of Consultation under date the 27th May, 1852.

Read the following Memo. from Major G. Balfour.

(*Here enter May*, 1852.)

No. 2. Ordered that ten sets of the China Cotton cleaning machine presented by Major Balfour be made up at the Arsenal and forwarded to the Collectors of the Districts noted in the margin with a request that they will exhibit them to the natives of their District or if necessary have others made for distribution in the principal cotton villages and that a trial be made of the efficiency of the machine and the results reported to Government at the end of a year.

(Margin: Bellary. Cuddapah. Madura. Tinnevelly. Coimbatore.)

Ordered that one Gin be forwarded to Dr. Wight.

Ordered also that copies of Major Balfour's Memo. be printed and circulated to the Collectors to whom the Gins, to be made in the Arsenal, are sent, and that a Memo. explaining the way of working the machine be prepared in the Arsenal also to be printed and circulated with the Gin.

Ordered that the following letter be addressed

To Major G. Balfour.

(*Here enter* — *May*, 1852.)

(Signed) H. C. M.

No. 482.

To Major G. Balfour.

Sir,—I am directed to acknowledge the receipt of a China Cotton Gin presented by you to Government together with a Memo. explanatory of its use and efficiency and in forwarding to you Extract Minutes of Consultation of this day's date to convey to you the acknowledgements of the Right Honorable the Governor in Council.

Fort St. George, 27*th May*, 1852. (Signed) H. C. M.

MEMORANDUM.

Major Balfour begs to recommend to the Chief Secretary to Government to authorize two cotton clearing Gins of the Pattern in use in China to be sent to Messrs Longshaw and Co. who are a Firm from Manchester located in Tinnevelly to obtain supplies of cotton for the Home market.

With the permission of the Chief Secretary Major B. will place with the Records of the Cotton Reports on the experiments, the application forwarded by Messrs Longshaw and Co. and also with it the reply which Major Balfour will make to the Firm and in which Major B. will offer some suggestions about the cotton.

As an improvement to the Cotton Gin Major B. suggests applying two small Cog Wheels which appear to improve its working and one of the Gins sent to Messrs. Longshaw and Co. might be supplied with these Wheels.

Major Pears, c. b. having applied for a cotton Gin, Major Balfour begs to recommend that two be sent to him, one with, and one without the Cog Wheels.

Probably it might be advisable to address Messrs. Longshaw and Co. and Major Pears, c. b. requesting that the results of the experiments with the Gins may be reported for the information of Government, the former communicating through the Collector of Tinnevelly, and the latter direct to the Chief Secretary.

Major Balfour hopes the Government will allow the Arsenal to make up and supply to the Museum two of the Gins, one with and one without the Cog wheels.

Major Balfour recommends the republication of the Memorandum with an addition to it describing the improved Gin.

(Signed) G. Balfour, *Major*.

18*th September* 1852.

No. 975.

Extract from the Minutes of Consultation under date the 2nd October 1852.

Read the following Memo. from Major Balfour.

Here enter 18*th September* 1852.

As suggested by Major Balfour in the above Memo; the Right Honorable the Governor in Council resolves to direct that 6 sets of the China Cotton cleaning machine be made up at the Arsenal and distributed as follows :

2 Sets for Messrs. Longshaw and Co. at Tinnevelly to be sent through the Collector of the District, one of which sets will be supplied with Cog wheels.

2 Sets, viz., one with and the other without Cog wheels for Major Pears, C. B.

2 Sets (as above) for the Museum.

2. The Government see no objection to Major Balfour placing with the records of the Reports on Cotton Experiments, Messrs. Longshaw's application and his reply.

3. The Government consider it very desirable to have reports on the results of the Experiments with these Gins and will apply for them to Major Pears, and through the Collector of Tinnevelly to Messrs. Longshaw and Co.

4. Major Balfour will be pleased to furnish a copy of the Memorandum referred to in the last para when orders will be issued for its being printed.

(Signed) H. C. Montgomery.

No. 482.

From B. Cunliffe, Esq., Acting Secretary to the Board of Revenue.

To Sir H. C. Montgomery, Bart. Chief Secretary to Government.

Rev. Dept.

F. Bellary 30th Sepr. in cons. 10th Octr. 1853.
F. Cuddapah 30th July in cons. 11th Augt. 1853.
F. Madura 25th Augt. in cons. 1st Sept. 1853.
F. Tinnevelly 9th Augt. in cons. 15th Augt. 1853.
F. Coimbatore 1st in cons. 8th Augt. 1853.

Sir,—With reference to Extract Minutes of Consultation dated 27th May 1852, I am directed by the Board of Revenue to submit for the information of the Right Honorable the Governor in Council the papers noted in the margin, being the reports of the several Collectors to whom Major Balfour's China Cotton cleaning machines were forwarded for trial.

2. The Collector of Cuddapah represents that he is unable, at present, to furnish his report on the Cotton cleaning machines, as he has not yet been able to see their working, owing, it would appear, to there being no one in the district who can put them in order. Mr. Murray has written to Major Balfour for directions, but has not yet received a reply. The Board have also addressed Major Balfour on the subject.

3. The Collectors of the remaining four Districts report unfavorably of the machines, as the natives prefer the common country Churka, which is more simple in structure, less expensive, more effective in working, and cleans a larger quantity of Cotton than the China machines.

4. The Collector of Tinnevelly has furnished two very full reports from Mr. Cuxton, late in charge of the Gin House at Sevacassy in which the failure of the machines is attributed to the iron roller continually ceasing to revolve.

5. The Collector of Coimbatore states that he believes Dr. Wight also tried the machine, and was unsuccessful in introducing it.

Revenue Board Office, Fort St. George, 24*th October* 1853.

(Signed) B. Cunliffe, *Ag. Secretary.*

No. 58.

From C. Pelly, Esquire, Collector of Bellary.

To B. Cunliffe, Esquire, Acting Secretary to the Board of Revenue, Fort Saint George.

Sir,—With reference to the Extract from the Minutes of Consultation under date the 27th May 1852 communicated in the Extract from the Proceedings of the Board of Revenue dated 14th June 1852 directing two sets of the China Cotton cleaning machines prepared by Major Balfour to be forwarded to me, and requesting that a trial be made in this District of the efficiency of the same and the result reported to Government at the end of a year and the letter of the Secretary to the Board dated 25th July 1853, calling for the above information, I have the honor to state that immediately on receipt at the end of last year of the machines together with a printed copy of Major Balfour's Memo: and a Memo: explaining the way of working the machine, I at the time of Jummabundy settlement for Fusly 1262 caused the machine to be shown to the ryots and others and the manner of working it explained to them and sent orders to the Talooks regarding the same.

I caused four cotton gins such as the two sent here to be made up at the rate of 4 Rupees each and made them over to some people of the principal cotton villages. But the machine does not seem yet to take, for ryots of other villages have not made up any of the Machines themselves in consequence partly of its being difficult to make them up in the villages, nor made application for them owing probably to their being too expensive and the advantage of them over their own not sufficiently established. The cotton cleaning machines that are commonly used in this District are procurable at four annas each and are worked with ease by both men and women. The China Gin is new to them and it must be left to time to see whether the people will approve of them. Encouragement will still be given to the people to give them a fair trial.

Bellary Collector's Office, on Circuit at Anantapoor, 30*th Septr.* 1853.

(Signed) C. Pelly, *Collector.*

No 66.

From M. Murray, Esq, Acting Collector of Cuddapah.

To W. H. Bayley, Esq. Secretary to the Board of Revenue, Fort Saint George.

Sir,—1. With reference to your letter of the 25th Instant, I have the honor to inform you that I regret exceedingly that it is at present out of my power to furnish you with the report called for in Minutes of Consultation dated the 27th May 1852, as I have not been able to see the working of Major Balfour's cleaning Cotton Machines.

2. On the receipt of those Machines, an attempt was made to put them in order, which no one has yet been able to do. A letter was in consequence forwarded to Major Balfour on the 11th September 1852, explaining the difficulty in making the roller revolve by means of the fly bar, and requesting that he would forward a drawing of the machine in work, with any further directions for working the flybar and treddle that he might be able to furnish; to this request no answer has yet been received, although daily expected. I therefore request you will, under the sanction of the Board of Revenue, apply to Major Balfour for the necessary information, together with the drawing, and furnish it to me at your earliest convenience. On receipt of which, a report will be forwarded without delay.

Cuddapah District Collr. Cutcherry, 30th July 1853. } (Signed) M. Murray, *Acting Collector.*

No. 1705.

Extract from the Proceedings of the Board of Revenue under date the 11th September 1853.

The Board resolve to forward a copy of the above letter to Major Balfour, with an intimation that they will be happy to be the medium of any communication which he may be desirous of making to the Acting Collector of Cuddapah, respecting his Cotton cleaning machine.

(Signed) W. H. Bayley, *Secretary.*

No. 88.

From T. Clarke, Esq., Ag. Collr. of Madura.

To W. H. Bayley, Esq., Secretary to the Board of Revenue, Fort Saint George.

1. Sir,—In reply to your letter of the 25th Ultimo I have the honor to report that the China Cotton Gins received with Extract from the Proceedings of the Board of Revenue dated 14th June 1852 have not been approved by the Natives of this District who prefer the native cleaning machine already in use among them as more simple in structure, more effective in working and cheaper than the China one.

2. The machine as soon as received was exhibited to many Natives in Madura and circulated in the Cotton growing Villages of this part of the District in the Sub Division. I myself exhibited and explained to the people its structure and way of working it, and was always told that if the expense of making and the impossibility of repairing it had not proved effectual bars to its general introduction, the difficulty in working it and the small quantity of cotton cleaned by it as compared with the common country Gin rendered them averse to adapt it.

3. Mr. Fischer the Moottadar of Salem also examined the Machine and made some alteration in it to adopt it to the use of the natives of this part of the country. He has kindly favored me with a report of the success attending his effort to introduce it among the cotton growers employed by him with his own opinion on the machine itself. I do myself the honor of forwarding a copy of his communication for the information of Government.

Madura, 25*th August* 1853. } (Signed) T. Clarke, *Acting Collector.*

From G. F. Fischer, Esq. Salem.

To T. Clarke, Esq. Acting Collector of Madura.

Sir,—I have the honor to acknowledge the receipt yesterday of your letter of the 6th Instant.

I had a "China cotton Gin" very correctly made, after the muster of the one sent to the Madura Cutcherry, and afterwards improved it by enabling the party working it to sit down and have given it a very fair trial but it is so expensive,* costing 8 or 10 times as much as the common country Gin, requiring 2 people to work it and not doing by any means twice the quantity of work, and that it is not so easily repaired or adjusted as the country Gin when it gets out of order; and for these reasons it has been condemned and given up.

* This Gin cost me Rs. 4-8 made in my own store, whereas a good Gin can be bought for half a Rupee.

(Signed) G. F. Fischer,
(True Copy)
(Signed) T. Clarke, *Acting Collector.*

Salem, 15*th August* 1853.

No. 167.

From C. J. Bird, Esq., Collector.

To W. H. Bayley, Esq., Secretary to the Board of Revenue, Fort St. George.

Sir,—With reference to Extract from Minutes of Consultation dated the 27th May circulated with the Board's Proceedings of 14th June last, I have the honor to forward for the information of Government copies of 2 letters* from Mr. Cuxton, late in charge of the Gin House, at Sevacassey, explaining the result of the trial made of the efficiency of Major Balfour's Cotton cleaning Machine therein mentioned, and to inform you that of the 2 sets sent to this District, the one tried by Mr. Cuxton is now at Sevacassey, the other was retained at my Huzzoor Cutcherry at Tinnevelly

* Dated 1st March and 30th July 1853.

and attempts were made two or three times after its arrival to put it on operation but without success. The failure was similar to what Mr. Cuxton describes, the iron roller continually ceased to revolve.

(Signed) C. J. Bird, Collector.

Tinnevelly, Sevacassey, 9th August 1853.

To C. J. Bird Esq., Collector of Tinnevelly.

Sir,—I regret to be obliged to inform you that my Chinese Churka, notwithstanding it worked tolerably well for a time has now lost its working qualities. It was in working order when you were here a short while ago, and for some days after I had it at work in the Gin House by my Maistry and also took it into the Village to the Churkaing godowns whereas it was then working well, it attracted the attention of the people. But its working propensities do not seem to be of a lasting nature, and it gradually began to work slower and slower until at last it has come to the old story of the iron roller stopping. As the machine now stands there is no perceptible cause or obstruction on account of which the iron roller should stop as it does, and as no coaxing nor management of mine has succeeded, in getting it into working order, I have given up the machine in thorough disgust and dispair. A clever blacksmith from Madura whom I have lately been employing here heard a few days ago of a Churka similar to mine being at work at Virdooputty and asked permission to go across and see it. I was but too glad of the circumstance and told him to go over and carefully examine the machine. The accounts he brought back were as follows. It would appear that Mr. Parker at Madura being in possession of one of the Churkas similar to mine gave it over to some Shanar people at Madura to make trial of it. I am informed that they tried and very soon gave it up in disgust from the same fault of the iron roller not working. They afterwards built a machine of the same sort, *low*, and by means of iron nuts attached to each roller, on which (within the compass of an inch) they filed out the endless screw heads such as they have on the common churka, I am informed the machine works well and both rollers keep on revolving regularly. They have also beside the fly bar to attach to the iron roller, but when the Smith saw it at work, they were working it without the fly bar on. It strikes me that without some such little assistance as a *small extent* of the endless screw head on each roller the machine as it is at present will not, or at least, does not seem to answer. I have myself spared no pains or attention to the machine as I have been much interested with it and was hoping that it would answer the purpose it was sent for, and supercede the common imperfect and slow working native churka. If you should think fit to sanction my experimenting with the screw attached to each roller, I shall be glad to have it done as carefully and as economically as I can. The churka of the Shanar man was I believe built at Madura, and as he has friends and agents in business at Virdooputty and Arapoocotta he sent it down to them to try it in their churkaing godowns, and I believe it is eventually to go on to Arapoocotta. I should have made this communication to you earlier, had it not been that I have been laid up with an attack of bilious fever for the last 15 days, but now by the grace of a kind Providence, and the help of a few medicines I happened to have on hand, I have come round again reduced and still weak.

(Signed) R. M. Cuxton.

(True Copy.)

(Signed) C. J. Bird, Collector.

Sevacausey, 21st March 1853.

To C. J. Bird, Esquire, Collector of Tinnevelly.

Sir,—I herewith beg to forward my report about the China Cotton cleaning Machine. As the result of a great deal of attention and trouble taken on my part with the machine in question. I am disposed to say that all the goodness and capabilities for work &c. of the machine lies no where more strongly displayed or developed than in the paper of instructions which accompanies it, as the machine itself I have found to be the most teazing and tantalizing one imaginable, inasmuch as it would work well for a while and then break off again, by the iron roller not continuing to revolve freely, as at times. I have, however, had the good luck to have it working properly at times during which period I have shewn it to the cotton cleaners of this place, and allowed them to handle and work the machine in my presence in their cotton cleaning houses. During even its best times however it could not compete with the common Churka for quickness or nicety of work, although it worked much easier than the common Churka, This has been tried by the two machines working side by side, on an equal quantity of cotton weighed out to each. On the cotton cleaners suggesting that an iron roller more proportionate to the wood one (than the small one originally sent) might be tried. I got one made up at my own cost. This likewise worked well and easily for a while until at last it also took to stopping every now and again, and this not from getting jammed by cotton, or any other perceptible cause, I was compelled at last from being unable to counteract this stopping of the iron roller to give up working at the machine. I have found that during the time it worked well, the use of treddle could be totally dispensed with.

I also beg to point out what seems to me some

discrepancies between the instructions and the capabilities of the machine. The paper of instructions makes the iron larger than the wood roller which is I fancy a mistake, neither were they as 1 inch diameter (which should be the wood) to ¾ inch diameter the iron, for as sent, the iron roller seemed very disproportionate to the wood one, and by referring to the accompanying slip of paper it will be seen than 1, and ¾ inches (diam) are by no means disproportionate dimensions for 2 rollers. Another discrepancy is the statement that from the machine "being on a sufficiently wide base, and of a sufficient weight" this was enough to keep it steady when the rollers are in motion which I beg to state I have not found to be the case on the whole the paper of instructions is very plausibly drawn out, but my best exertions have not succeeded in developing its many good qualities. The experiment on the rollers with the screw as sanctioned by you has been completed and I have had the machine at work at times as I could spare the services of my Maistry for the purpose. The result is that the two rollers revolve freely together now, and I would suggest that it should be handed over to any one of the cotton cleaners of Sevaeausey for *continual* use in order to improve and bring it into good working order.

(Signed) R. M. CUXTON,
(True Copy)
(Signed) C. J. BIRD, *Collector*.

SEVACAUSEY, 30*th July* 1853.

No. 58.

From E. B. THOMAS, Esq., Collector of Coimbatore.
To W. H. BAYLEY, Esq., Secretary to the Board of Revenue, Fort St. George.

Sir,—In reply to your letter of the 25th Ultimo, I beg to inform you that the Cotton cleaning machine forwarded by Major Balfour has not succeeded as I had hoped it might. The common Native Churka, (of which it seems only a slight modifications in principle, though differing in shape) admits of being worked sitting on the ground, while Major Balfour's requires sitting on a stool, and the use of the foot also to which the Indian women, who alone clean cotton, are not inclined or accustomed at present. Dr. Wight also tried it, and I believe was unsuccessful in introducing it.

(Signed) E. B. THOMAS,
Collector.

COIMBATORE, 1*st August* 1853.

Ordered that the foregoing letter be recorded.

No. 109.

Extract from the Proceedings of the Board of Revenue, dated 13th March 1854.

In Cons. 13th March 1854.

Read letter dated 26th December 1853 from the Collector of Bellary, reporting upon the working of the Dharwar Cotton Gins.

(*Here enter No.* 87.)

Resolved that the letter above recorded be submitted for the information and orders of the Right Honorable the Governor in Council, with reference to Extract Minutes of Consultation dated 18th October 1853.

2. In the order of Government just quoted, the Collector of Bellary was required to explain his omission in not forwarding a report upon the working of the Gins at the close of the year for which they were sanctioned, and to state what use is now being made of them whether the services of a Carpenter from Dharwar are required and if so, for what period. The Government also wished to know if any of the machines are being worked in the Cuddapah District and with what results.

3. In regard to the delay commented on, Mr. Pelly explains that the experiments with the Gins were tried only for 6 months in 1852, instead of a full year as authorized by Government; and that

6th January 1852.

therefore be defered making a report till a further trial had been made; and that the delay has entailed no expense to the state.

4. The reports that 4 Gins were procured in all from Dharwar from the time the experiment commenced, and the two of these having been taken by the Commissioner of Kurnool and the Cotton Superintendent of Coimbatore, the remaining twelve were sold to native Merchants in the District without charge to Government, six of the machines being taken by Bussavangowd and Narrain Reddy, two wealthy residents in the Gooliem Talook. The Gins were used for a short time, but as they got out of order and no one was at hand to put them in repair, they were gradually disused, with the exception of those in the possession of the Gooliem Reddies, who employed a Dharwar carpenter at their own expense to keep the machines in repair, and worked them with considerable profit. The quantity of Cotton cleaned by these machines in 1852 and 1853 amounted to 2,016 maunds.

5. But the heavy outlay required for the purchase of the Saw Gins and the necessity of keeping them in working order (for which the necessary skill is not always available in the District) have hitherto retarded the general employment of these machines by the Ryots. The Collector however observes that as their use becomes better known, they will be more sought after, provided measures are adopted for instructing the local carpenters in the method of repairing them when put out of order.

6. For the furtherance of this object, the Servi-

Enclosure in from Government 18th October 1853.

ces of one man from Dharwar as proposed by the Bombay Government would be hardly effectual Mr. Pelly therefore recommends an expenditure of 1260 Rupees to be laid out as follows.

	Rs.
Pay of 6 Apprentices to be sent to Dharwar to be instructed in the use and repair of the Gins at 10 Rupees each per mensem for 3 months. - - - - - -	180
Pay of 12 qualified carpenters to be employed after the return of the former to the District for 6 months at 15 Rupees each, -	1,080
Total Rupees...	1,260

7. As the expenditure sanctioned in Extract Minutes of Consultation dated 6th January 1852 has not been availed of, and is on too limited a scale to effect much good, the Board of Revenue beg to recommend that the Collector may be authorized to incur the above expense of 1260 Rupees in the mode proposed, should he be able to find men willing to proceed to Dharwar for instruction. It will be observed that the superiority of the Saw Gin over the common churka of the country for the purpose of cleaning cotton is considered to be established, and that it only requires the capital to purchase and the skill and means of keeping it in repair to bring it into general use by the people.

8. The Board have not received a report from the Collector of Cuddapah to enable them to reply to the last clause of the order of Government, but that officer has promised to supply the information called for at an early period.

Unanswered List for 4 quarter of 1853.

(A true Extract.)

(Signed.) W. H. Bayley,
Secretary.

No. 87.

From C. Pelly, Esq., Collector of Bellary.
To W. H. Bayley, Esq., Secretary to the Board of Revenue, Fort St. George.

Sir,—With reference to the Extract from the Proceedings of the Board of Revenue dated 2nd November 1853 forwarding copy of Extract from the Minutes of Consultation under date the 18th October 1853 in which it is observed that authority was given for the employment of two Carpenters for six months in this District for the purpose of the Experiment with the Dharwar Cotton Gins for another year as sanctioned by Government in their Extract Minutes of Consultation of the 6th January 1852 and that no report, as directed, was made after the expiration of the year of the result of the experiment and I am directed to be called upon to account for the omission and to explain what use is now being made of these Cotton Gins here whether the services of a Carpenter from Dharwar are required, and if so, for what period.

2. In reply, I have the honor to state that my not having submitted a report, as directed, is not from inattention to the order. But I deferred doing so to allow of a sufficient time for testing the experiment, it having been tried for six months only in last year during the Cotton cleaning Season in the hope of being better able to make a satisfactory report as the Government had allowed a full year's Experiment, and as no expense has been incurred by Government, I trust I shall be pardoned for having deferred sending a Report on the subject.

3. From the time the Experiment of the Dharwar Gins commenced 14 Cotton Gins have been procured from Dharwar with the view to extending their use in the District; one of them was taken by the Commissioner of Kurnool and another by the Cotton Superintendent of Coimbatore the remaining 12 were taken by some of the more wealthy Cotton cultivators of the District without charge to Government.

1—By Mohodeen, a shop keeper at Bellary.
1—Goodadha Veerapah of Hirrayhadagalee in the Hoonenahadagally Talook.
2—One by Toombalabeedoo Kyroopalapa and the other by Madganoor Jumbanah in the Adonie Talook.
6—Two small and one large (cost at 200 Rs.) by Holalagoondy Bussavanagoud and the other three as above by Joharapoor Narrainreddy of the Goollum Talook.
1—By Konakondla Iyanagoud of the Gooty Talook.
1—By Mullareddy garee Samereddy and 7 others of Kasanoor in the Tandepatry Talook.
12 Total.

The price of the smaller Gins consisting of 6 saws each was 50 Rupees, and of the two larger Gins which contain 18 saws, each 200 Rupees, the amount has been all paid to the Collector of Dharwar.

4. The Gins were used for a short time but through ignorance and inability to put them into working trim when out of order the use of the Gins ceased, and the people were discouraged. To overcome the difficulty I represented the matter and obtained the sanction of Government to disburse 210 Rs. for the employment of 2 carpenters for 6 months. But in the mean time two wealthy Reddies of the Goollem Talook who were very desirous to try the experiment with the Dharwar Gins requested me to procure them an experienced carpenter offering to pay him themselves and I accordingly got one for them from Dharwar in Fuslies 1261, and 1262. The Reddies employed this carpenter for the time they required his services on a monthly salary of 15 Rupees, and Batta at the rate of 3 annas per diem, and carried on the business with him for two seasons they succeeded in cleaning 716 Maunds with the 4 smaller Gins in the first year and 1300 Maunds with the 2 large Gins in the 2nd year. These two Reddies are willing to employ the Carpenter in future.

Fusly,......	1261	1262
Year,......	1852	1853
	Maunds.	
Narrain Reddy,	216	600
Basava nagound,	500	700
	716	1,300

5. The Cotton thus cleaned by the Darwar Gins was sold at Bangalore and Madras and realized a better price than cotton cleaned by the common churka, but not more (as stated by these Reddies) than about 3 to 4 per cent. The cost of cleaning by the Dharwar Gin is however much less but the expensive hire of the Carpenter swallows up much of the profit.

6. And the profit that remains with the attendant risks and heavy outlay for first cost of Gins is not sufficient to induce the ryots generally to adopt these Gins : seeing this I refrained from taking further measures to endeavour to promote the more general use of these Gins immediately, preferring to let the advantages develop themselves gradually. It must be left to time. The two Reddies have found them to answer to a certain extent, and they are willing to continue to use them if in the end they find them to be really profitable others will follow their example, and as they were in a position to pay the Carpenter themselves I refrained from making use of the sum sanctioned by Government. But it is obvious that the success of the Gins is dependent as any other machine more or less complicated must be upon the means at hand to keep them in a proper working state, in short the working of the Gins must depend upon the Carpenter, if he is not to be had, the work is at stand.

7. To remedy this evil and to enable a few of the more wealthy ryots only to use the machines, a certainty of being able at all times to command the services of experienced carpenters appears to me an essential point to be first gained. To depend upon the uncertainty of obtaining one or two carpenters from Dharwar on high salary at the time required is not sufficient. We must endeavour to train some dozen or more of the carpenters of the District to the business, and I would now recommend that Government, if they are disposed to give their further aid in promoting the use of these undoubtedly valuable machines in this District, should give that aid in expending a sum of money in training *Bellary* carpenters to the work at the work-shops in Dharwar after being properly trained there they would return to the district and be always available to render their services to any ryot who should require them at a more moderate cost, and they would train their sons and others also to the work. I may find difficulty in procuring proper carpenter for the purpose willing to undergo an apprenticeship at Dharwar. But I hope to be able to procure 6 men, the cost for training them would be about 180 Rupees, and they could train 12 more at a cost of 1080 Rupees for the sum amounting to 1260 Rupees the sanction of Government is necessary as follows :

180 0 0 Pay of 6 men for the purpose of procuring to Dharwar to be there trained at 10 Rupees each per month for the period of 3 months.

1080 0 0 Pay of 12 men trained here by the above parties after their return at 15 Rupees each per month for the period of 6 months.

1260 0 0 One thousand two hundred and sixty.

8. It is certain that the Gins when properly handled are remunerative the two Reddies above referred to prove this by the fact of their requesting me this year to procure for them the two large sized Gins of 18 saws, each of which cost 200 Rupees at Dharwar, and which had never been before introduced into Bellary when they already had 4 of the smaller Gins and by the fact, that they are quite satisfied to go on with the operation this year. Their example will probably in due course stimulate others. But others will not be able to undertake the work unless they can easily procure carpenters, and therefore I think the most desirable mode in which the assistance of Government can be given is by training men of Bellary in the manufacture, repair and use of the Gins and for this reason I would beg to recommend that sanction be granted for the disbursement of 1260 Rupees in the manner proposed should I be able to avail myself of it. I am of opinion that these machines may be introduced to a greater extent with advantage But at the same time I do not think they will be generally used by the ryots but their use will be confined to the wealthier class of ryots only.

(Signed) C. Pelly,
Collector.

Bellary, Collector's Office : 26*th Dec.* 1853.

No. 450.

Extract from the Minutes of Consultation under date the 20th April 1854.

Read the following Extract from the Proceedings of the Board of Revenue.

(*Here enter* 13*th March* 1854, *No.* 109.)

Pay of 6 Apprentices to be sent to Dharwar to be instructed in the use and repair of the Gins at 10 Rupees each per mensem for 3 months.	180
Pay of 12 qualified Carpenters to be employed after the return of the former to the District for 6 months at 15 Rs. each.	1080
Total Rs.	1260

Under the circumstances represented by the Collector of Bellary in his Report of the 15th December last upon the working of the Darwar saw Gins in his District and at the recommendation of the Board of Revenue, the Right Honorable the Governor in Council sanctions the employment of a temporary Establishment as per Margin for the purpose of instructing the people in the use and repair of these Machines and at a total cost of Rupees (1260) one thousand two hundred and sixty which will be in lieu of that authorized in Extract Minutes of Consultation 6th January 1852.

(Signed) T. Pycroft.
Secy. to Govt.

No. 207.

From C. J. BIRD, ESQ., Collector.

To Sir H. C. MONTGOMERY, Bart. Chief Secretary to Government, Fort St. George.

Sir,—1. With reference to the correspondence noted in the margin, I have the honor to submit copy of a report* received from Mr. Lees at Trichundoor on the results of his experiments with the two Cotton Gins made over to him agreeably to the instructions of Government.

From Govt. 2d Oct 1852
To do. 18th April 1853
To do. 30th Aug. „
From do. 20th Sept. „
* 7th July 1854.

2. From this report as well as those of Mr. Cuxton, copies of which were submitted to the Board of Revenue on the 9th August 1853 for transmission to Government, it will be seen that the instruments in question is not found to answer in this Province.

3. As Mr. Lees has relinquished his attempt to grow New Orleans Cotton, and is about to return to England the Gins will be kept under my charge until any use may be found for them.

I have the honor to be, &c.,
(Signed) C. J. BIRD.
Collector.

TINNEVELLY, TENCASEY,
11th July, 1854.

To C. J. BIRD Esq. Collector of Tinnevelly.

Sir,—I promised a few days ago to give you the results of my trial of the Chinese Cotton Churka.

It was with great difficulty I succeeded in getting the women to work it, for any length of time.

They complain that they could not get it to steep the seed clean.

The only fair experiment I gave it was upon some Native Cotton.

One Woman turned out 1½ lb of clean Cotton, working six hours for which she received 11 pice (Eleven). This was her best days work.

The upper roller which is of steel appears too smooth, it would certainly be an improvement to have that roller very finely fluted.

One great drawback to the machine in its present form, ever becoming much used in this District, is that a woman cannot sit to her work, as she usually does to the country Churka.

I have lately been ginning Sea Islands and Egyption Cotton and have tried both through this machine, with very poor results.

The women work much better with the country Churka and get through a greater quantity per day with less fatigue whilst they are turning out 2 lb with the Chinese machine they turn out 5 lb with their own country Churka. The machine in its present construction is very much more difficult to work than the country Churka. But it might be made very much lighter.

I shall have much pleasure in handing over to you or to any one you name, the *two machines* which I have for further experiments or use.

Believe me to remain
Your obedient servant,
(Signed) W. ARTHUR LEES.

TRICHENDOOR,
7th July 1854.

(True Copy)
(Signed) C. J. BIRD.
Collector.

Ordered that the foregoing letter be recorded.
(True Copies)
M. NORMAN.
Deputy Secretary to Government.

APPENDIX B.

No 505.

To the INSPECTOR GENERAL of Ordnance and Magazines, Fort Saint George.

Sir, With reference to your Resolution No. 862 of 4th instant, I have the honor to submit the following remarks.

Previous to the year 1855, no Hammers appear to have been used in the Bangalore Arsenal for welding or working iron; but those of the ordinary description weighing from twelve to fourteen pounds,

2nd. In consequence of the failure of several 4 inch square iron axles, belonging to 8 inch iron Howitzer wrought Iron Carriages, during the year 1855, I applied to and obtained permission from the Military Board to make an axle on a principle differing from that before followed my plan was to weld together, layers of flat iron 4 × 1 inch, of the full length required by which means, I hoped to ensure solidity throughout the entire axle including the shoulders. The result of my experiment was, as you are aware, in the highest degree satisfactory, all attempts to break the axle during its severe proof having failed. Regarding the hammers used in its construction, I quote as follows from my letter No. 519 of 21st June 1855 addressed to the Secretary Military Board. " In working the iron with the ordinary Sledge Hammers of from twelve to fourteen pounds, I found little or no impression made excepting on the surface and it appeared hopeless to attempt drawing out the metal by such means, I therefore erected a temporary Hammer for the purpose which I found to answer well, considering the difficulty under which it was worked: the Hammer was made from an old Foreign 13 inch Shell which was filled with melted lead, and a rod of 1½ inch round Iron fixed in the mass; this was then attached to the apparatus for bouching Guns, and worked by means of two Bamboo Levers; the shell when filled with lead weighed about 350lbs and it could be worked by four or six Lascars,"

3rd. Being encouraged by the Military Board to persevere in my experiments in working Iron, I constructed and put in use a Hammer of my own invention, a model of which I exibited at the Madras Exhibition of 1857 since its first construction (early in 1856) this Hammer has been constantly used for all heavy Iron work executed in this Arsenal, including the breaking up and rewelding wrought Iron Shot, and the reworking country iron purchased in its half wrought state, also, on this subject, I quote as follows from my letter no 756 of 17th November 1856 to the Secretary Military Board. "With reference to Extract from the Proceedings of the Military Board No. 2114 of 11th August 1856, I have the honor to report that in accordance with the Board's desire the broken cheek of the 8 inch Iron Howitzer wrought iron Carriage has been repaired, annexed is a copy of its proof which is highly satisfactory." * * * *

"The welding of the broken cheek of the 8 inch iron Carriage proved a very difficult operation. The original fracture was situated about a foot and a half above the turn of the trail, after welding together on the same principle as in the formation of the axletree, a sufficient mass of iron to form a new Trail, that is, the Trail end of cheek. I caused the broken end of the upper part of the cheek to be jumped up so as to obtain a sufficient body of metal to join the two pieces together, without losing thickness; but in this process, the old part of the cheek gave way about a foot and a half below the lower connecting bolt or Transom, and I was obliged to cut off about a foot of the old cheek, and add on to the new mass in proportion, and forced again to jump up the upper portion of the cheek, I may here remark, the great difficulty rests in jumping up the broken ends when performing a job of this kind, in the first attempt this was done by blows of the Sledge Hammer; but in the second, I caused a triangle of a 10 cwt. scale to be placed close to the forge, and with a rope passing over a pulley fixed to the top of the triangle, I caused the old half of the broken cheek (weighing about 300 lb) to be raised about 2 feet and dropped heated end down upon an anvil sunk into the ground, when a sufficient thickness was obtained at the end, I caused the iron to be reheated, and then cooling about an inch of the extreme end in water I continued the drop hammering till thickness was obtained higher up and so on till a thick and solid mass of iron was obtained."

"In the foregoing operation, the Hammer* machine lately constructed here, which works with great ease by means of cog and fly wheels (was used with much effect). The Hammer had a fall of about two feet and weighed full 500 lbs. giving on an average about 40 blows in a minute"

* A model of which was sent to the Madras Exhibition of 1857.

* * * *

4th. In the present year under authority from the Military Board, I built a carriage for an 8 inch Iron Howitzer, according to my own plan, it is furnished with one of my welded iron axles 4 inch square with shoulders constructed from bars of one inch thick iron, as already described, this axle and all the heavy Iron works of the carriage were welded and worked under my Hammer * The

* The Campbell Hammer.

Carriage weights		cwt.	qr.	lb.	
	Body weight	12	2	23	being 18 lb.
	Wheel „	8	3	2	
	Total...	21	1	25	

lighter than the wrought iron carriages now in use for the same piece

		cwt.	qr.	lb.
	Body weight	13	0	15
	Wheels „	8	2	0
	Total...	21	2	15

and 7 cwt. 1 qr. 2 lb. lighter than those of wood the annexed copy of Proof Report puts the excellence of its iron work beyond doubt, and I have no hesitation in asserting that this result could not have been obtained had the ordinary Sledge Hammers alone been used.

I have, &c.

(Signed) T. Hay Campbell, Captain,
Commissary of Ordnance.

Arsenal Bangalore,
19th June 1857.

(True copy.)

G. Balfour, Lieut. Colonel
Inspector Genl. of Ord. & Magazines.

Report of a proof of the undermentioned 8 *inch iron Howitzer carriage, by order of Major Frederick Burgoyne, Commanding the Artillery in Mysore.*

Description.	Number of Carriage.	Number of Firings.	Nature and strength of powder.	Marks on the ordnance.	Marks on the Carriage.	Weight of Metal. Cwt.	Metal. Qtrs.	Metal. lbs.	Carriage. Cwt.	Carriage. Qtrs.	Carriage. lbs.	Charge. lbs.	Charge. Ozs.	Shells. lbs.	Shells. Oz.	Elevation. D.	Elevation. M.	Recoil. ft.	Recoil. Ins.	Time of firing.	Remarks.
8 Inch Iron	1	1	Service	↑	THC.	22	,,	13	21	1	25	4	,,	46	,,	PB.	,,	3	..	55 Minutes.	The first 4 Rounds were fired on soft sandy ground Trail sunk in consequence several inches.
plated Ho-		1	do.	1851	1857													1	2		
witzer car-		1	do.		No. 1.													1	...		
riage.		1	do.															1	2		At fourth round the right cap-square cracked, and inner Handspike loop broke, a slight fracture in the wood work of both side beams took place also and both side beams sunk about a tenth of an inch.
		1	do.															5	...		From 5th round to the 30th inclusive the firing took place on hard ground.
		1	do.															4	6		
		1	do.															4	6		
		1	do.															5	2		
		1	do.															4	...		
		1	do.															5	1		
		1	do.															4	10		
		1	do.															4	8		
		1	do.															4	.		
		1	do.															5	8		
		1	do.															4	3		
		1	do.															4	...		
		1	do.															4	...		
		1	do.															4	3		
		1	do.															3	6		
		1	do.															4	...		
		1	do.															3	...		
		1	do.															4	6		
		1	do.															4	6		
		1	do.															4	...		
		1	do.															5	...		
		1	do.															4	4		
		1	do.															4	10		
		1	do.															5	8		
		1	do.															6	...		
		1	do.															5	6		
		1	do.													Ave	rag	2	5		Trail blocked with pegs, which however gave way at this Round and the next two Rounds are fired on hard ground.
		1	do.													6	30	7	4		
		1	do.															11	...		
		1	do.															1	2		
		1	do.															6	8	One hour and ten Minutes.	
		1	do-															3	6		At this Round the trail was sunk about a foot into the ground during the next ten Rounds the firing was on hard ground.
		1	do.															7	...		
		1	do.															7	...		
		1	do.															9	6		
		1	do.															3	1		
		1	do.															2	3		During these three Rounds the wheels were blocked with stones.
		1	do.															2	...		
		1	do.															9	4		
		1	do.															9	...		These four Rounds were on hard ground.
		1	do.															10	...		
		1	do.															10	...		
		1	do.													6	30	...	6		
		1	do.															...	3		
		1	do.															...	2		
		1	do.															1	3		
		1	do.															...	4		
		1	do.															...	3		
		1	do.															...	4		
		1	do.															...	4		

Report of a proof of the undermentioned 8 inch iron Howitzer Carriage, by order of Major Frederick Burgoyne, Commanding the Artillery in Mysore.

Description.	Number of Carriage.	Number of Firings.	Nature and strength of powder.	Marks on the Ordnance.	Marks on the Carriage.	Weight. Metal. Cwt.	Qtrs.	lbs.	Carriage. Cwt.	Qtrs.	lbs.	Charge. lbs.	Ozs.	Shells. lbs.	Ozs.	Elevation. D.	M.	Recoil. Feet.	Inches.	Time of firing.	Remarks.
8 Inch iron plated Howitzer carriage.	1	1	Service	⩚	THC.	22	„	13	21	1	25	4	„	46	„			...	1	1 hour and 10 minutes.	These fourteen rounds were fixed with the trail sunk about a foot in the ground. as indeed it was until the conclusion of the proof during the last 20 Ronnds the wheels were also sunk.
		1	do.	1851	1857													...	1		
		1	do.		No. 1													...	1		
		1	do.															...	1		
		1	do.															...	1		
		1	do.															...	2		
		1	do.													10	30	...	1	50 Minutes.	
		1	do.													12	15	...	1		
		1	do.													13	15	...	1		
		1	do.													11	30	. .	1		
		1	do.													12	30	...	1		
		1	do.													12	30	...	1		The carriage was also taken at a trot over stony and rongh ground, and has altogether had as good a test as it is possible almost for one to have with the exception of the trifling cracks in the side beams and the sinking of the side beams alluded to at the commencement of the proof no damage has been sustained by the carriage. The iron work with the exception of the cap square and Handspike Loop, also alluded to at commencement, has stood the test uncommonly well. No other injury whatever being perceptible to it.
		1	do.													12	45	...	1		
		1	do.													12	45	...	1		
		1	do.													13	...	..	1		
		1	do.													13	...	...	1		
		1	do.													11	45	...	1		
		1	do.													12	..	..	1		
		1	do.													12	...	...	1		
		1	do.													12	...	.	1		
		1	do.													12	..	...	1		
		1	do.													12	...	...	1		
		1	do.													12	..	...	1		
		1	do.													12	15	...	1		
		1	do.													12	15	...	1		
		1	do.													12	30	...	1		
		1	do.													12	30	...	1		
		1	do.													12	30	...	1		
		1	do.													12	30	..	1		
		1	do.													12	..	...	1		
		1	do.													11	45	...	1		
		1	do.													PB	...	..	1	Forty Minutes.	
		1	do.																1		
		1	do.																1		
		1	do.																1		
		1	do.																1		The proof was conducted as nearly as circumstances would allow in conformity with the instructions laid down for an extraordinary proof, and the results may, it is considered, be deemed highly satisfactory.
		1	do.																1		
		1	do.																1		
		1	do.																1		
		1	do.																1		
		1	do.																1		
		1	do.																1		
		1	do.																1		
		1	do.																1		
		1	do.																1		
		1	do.																1		
		1	do.																1		
		1	do.																1		
		1	do.																1		
		1	do.																1		
		1	do.																1		

BANGALORE, 13*th June* 1857. } (Signed) F. BURGOYNE, Major
Comg Arty. Mysore.

(True copy)
(Signed) T. HAY CAMPBELL, Capt.
Commissary of Ordnance.

(Signed) E. COUCHMAN, Bt. Capt.
Superintending the Proof.

N. B. by the Commissary of Ordnance.
The side beams mentioned as slightly fractured are merely used to fill up a space between the cheeks and the trail and have nothing to do with the strength of the Carriage.

(True copy)
G. BALFOUR, Lt. Colonel.
Inspector Genl. of Ordnance and Magazines.

CLASS VII.

REPORT UPON ARTICLES EXHIBITED AT THE MADRAS EXHIBITION.

Civil Engineering, Architectural and Building Contrivances.

Jury.

Colonel C. E. Faber,
Captain G. C. Collyer,
Captain H. W. Rawlins,
Major A. C. Silver,
Lieut. P. P. L. O'Connell, *Reporter.*
Major W. S. Jacob,
B. McMaster, Esq.,
Colonel A. T. Cotton,
Lieutenant-Colonel F. C. Cotton, *Chairman.*
A. Beattie, Esq.

Under Class VII are exhibited Models of works of irrigation, and navigation, of Bridges, Canal-boats, Wind-mills, several simple Hydraulic and Hydrostatic machines, and a coffer dam.

Model of the Kistnah Anicut exhibited by Capt. Farewell, Executive Engineer.

This is a neatly executed Model of the most important irrigation work, of which this Class contains a model; it is on a scale of about an inch to 40 feet; it exhibits the Annicut itself, the head sluices and locks on either side, and shews the under sluices one at each extremity of the work together with the stone groins constructed, some, to lead a large body of water past each head sluice and through the adjacent under sluice, and thus cause a scour and remove deposit from the vicinity of the head sluice to the rear of the Annicut, and others to protect the face of the Annicut from the influence of the cross currents which works of this kind generally cause.

On the Bezoarah side on the left bank of the river may be seen a representation of the Hill, which has furnished stone for the work; at the foot of this Hill and a little to the eastward of it are the Work-shops and the houses of the Officers, and the sheds of the people who have been engaged in the execution of this great work.

On the southern bank is the model of the Sectanugaram Hill.

The site of this work is where the northern coast road from Madras to Calcutta crosses the river, which is here narrowed, by the projection into its bed of the Sectanagrum and Bezoarah Hills, from 2,000 yards to 1,350.

The length of the Annicut is 1,150 yards, its breadth, including the rear Apron of loose stone, appears to be about 200 feet; the under sluices already described as shewn in the model, one at either extremity of the main work, are each 132 feet between the abutments: the head sluices, one to each of the two main channels which are led off from the river, are also each 132 feet between their abutments.

The locks, of which there is one attached to each head sluice, are 150 feet between their gates, i. e. the chamber of each lock is 150 feet in length.

The river Kistnah is very low in March, April and May, but for eight or nine months there is always a sufficient quantity of water to supply the two channels, which have been taken off, and to irrigate the lands which will be brought under their influence as soon as the necessary branches are executed.

The following Table shews the average quantity of water which passed down the river in the Months mentioned, as calculated in 1856 by Capt. Orr, the Civil Engineer of the Kistnah Division.

Months.	Average depth during the Month	Probable quantity in cubic yards per hour.	Remarks.
May... ...1852	10.3	14,000,000	The quantity required during these months when the whole is brought under irrigation will be 1,200,000 cubic yards per hour.
June............	12.11	24,000,000	
July............	22.3	55,000,000	
August.........	28.4	90,000,000	
September. ...	22.11	58,000,000	
October.........	19.9	45,000,000	
November.. ...	11.5	16,000,000	
December......	10.11	15,000,000	
January...1853	8.3	8,000,000	
February... ...	7.0	....	No correct estimate can be made of the quantity of water in these months, but it is supposed to vary from 5,00,000 to 100.000 cub. yds. except in exceptionably dry weather.
March........ ...	5.3	....	
April........ ...	6.8	....	

The amount of additional Government Revenue obtainable in consequence of the construction of this work has been variously estimated at between 40 and 45 Lacs of Rupees—its influence will be felt through considerable portions of the two Districts of Guntoor and Masulipatam ; the total area which may be irrigated by it was estimated at the time the work was first proposed at 1,100,000 acres or about 1,700 square miles.

One of the most valuable works in the country, and the second in importance among those of which this class contains a model, is the southern branch of the lower of the two great Annicuts across the Colleroon river with the bridge attached; the total length of the model measured from one wing wall of the Annicut to the other is 10'-10½" and its extreme height measured from the level of the apron of the Annicut to the top of the parapet of the bridge is 3 inches.

The Annicut itself measures 1233 feet between its wing walls, its design is exceedingly simple, a wall 8 feet in width and 8 in height, resting on wells sunk in the sandy bed of the river runs from the South bank to an Island in the centre of the river ; the ends of this wall are protected by two others called wing walls : the bed of the river immediately below the main wall or dam is protected by an apron attached to and forming part of the dam itself.

The bridge runs close along the Annicut on its up stream side, its piers run into and are connected with the dam so that the water commences to flow over the dam the moment it leaves the bridge. It has 30 arches divided into five sets of 6 arches each by four smaller arches connected with four sluices in the annicut ; the main arches of the bridge are segmental, span 33 feet 4 inches, rise 6 feet ; the arches over the sluices each span 17 feet.

The jury would call attention to this model exhibiting as it does with great accuracy the details of one of the most important irrigation works in Southern India ; it cannot of course lay claim to originality as it is a simple copy of an existing work, but in the present state of knowledge of such works possessed by the general public, it may fulfil the office of drawing attention to the simplicity of the means already employed in producing great results, and in this way prove of even more immediate use than models explanatory of perfectly new but untried designs.

The northern branch of this Annicut will, after certain alterations now progressing have been completed, be similar to the Southern one :—

Some idea of the utility and importance of this work may be formed when it is stated that the area watered by the channels connected with it is about 60,000 acres ; that the population fed on the produce of the lands thus irrigated cannot be less than 100,000, and that the Government revenue is about 3½ Lacs of Rupees or £35,000 a year, and the gross income of the cultivators about 7 Lacs of Rupees or £70,000 a year, the number of cultivators including labourers is probably not above 35,000 or 40,000.

Of contrivances for facilitating the raising and distribution of water for irrigation purposes this class contains several examples, two of these are models of the wheel used in South Malabar and Cochin. This simple machine appears from its neatness of construction to have been introduced by the Dutch.

It consists of a paddle wheel one half of the lower portion of which turns in a curved trough, so placed that the water raised in it cannot fall again to the level from which it was raised. The wheel revolving lifts the water in the trough, and as the sides are higher than the back board a constant stream is discharged over the latter ; such wheels are adapted to lifts of from one to three or even four feet.

The power applied to this wheel when profitably employed is the weight of one or more men walking upon the edge of the float boards, and is well represented in one of the models, the men employed using their feet as in the tread mill, while they balance themselves by the help of bamboo scaffolding raised on either side of the machine. When worked in this manner the wheel is most effective and exceedingly economical in its results, but as the labour is very great and skill required very considerable it would never probably have been introduced if the cultivators had not had at that time the command of slave labour.

By means of these wheels a great portion of the bed of a large lake is cultivated in the vicinity of Trichoor in the Cochin territory, for which purpose a dam consisting of stakes with cocoanut leaves or reeds twined in them supporting a narrow bank of mud is thrown round a field of many acres from two to two and a half feet deep in water. Two or more wheels are then fixed in the bank and the work being kept up night and day the space is soon cleared for cultivation.

As there is some leakage through the slight embankment the wheels remain in position, in order that the drainage may be effected as circumstances require, only enough water being left in the field for the rice crop growing.

The wheels have been used with excellent effect in clearing low foundations in Malabar, but they have never yet been brought into general use out of the locality in which they were first introduced.

Mr. Kennedy has exhibited a modification of the above wheel adding a handle to its axis to admit of the application of manual force.

There is a model of a Chinese Pump as it is called; it consists of a set of paddles attached to a rope working over two drums, situated at the upper and lower extremities of the Machine respectively; the revolution of the drums sets the rope in motion and draws the paddles along a trough: this instrument is only used for raising water to a height of two or three feet at the most as the upper side of the trough is left open—when used, it is placed so that the trough is inclined at an angle of about 5 degrees with the horizon, its lower extremity being placed in the water to be raised, a few of the lower paddles are thus dipped in the water and the moment they are set in motion they impel the water up the trough and out at its upper extremity on to the highest lands.

Mr. Overseer Liver exhibits the Model of a pump for clearing foundations by low lifts. This very simple Machine is composed of a box made by nailing four planks together and a piston rod working in it to which is attached at the lower end a leather bag or bucket. The planks are about one foot broad and any required length. The bucket is of leather square at the upper end to fit the box, and tapering to the lower end to fit close round the piston rod. The length of the bucket is about 18 inches—as the rod is thrust downwards the bag collapses and passes through the water, but as it ascends, the upper portion expands by the weight of the water till it fills the box. And as its form is square it fits closely into the corners carrying before it all the water that was either in the bag or above it when the up stroke commenced.

To prevent the edges of the bucket turning inside out a strap is led from each of the upper corners which is nailed to the piston rod about 18 inches above the bucket. These of course are so long as not to interfere with the bucket expanding.

The great advantage of this pump is that it may be made where a work is in progress in a few minutes and costs the merest trifle. It has been used in several Bridges in Ganjam with excellent effect, and will be very valuable to those who are at work in out of the way places.

The jury consider the exhibition of this pump worthy of a second class medal.

There is an interesting model of a moveable dam used in several parts of France, the model was made at the Gun Carriage Manufactury, at the suggestion of Major Boileau of the Engineers, and is exhibited by Major Maitland the Superintendent of the Gun Carriage Manufactory; it is thus described in the third volume of the Aide Memoire.

"M. Poiree Engineer in Chief of the navigation "of the Seine, introduced upon the Youne, and "subsequently upon the Seine itself, a kind of "moveable dam, whose application is spreading "very rapidly in France, it consists in the use of "a series of metal frames fastened together at the "top, so as to be laid flat on the bed of the river "by turning on their bases as hinges,the frames are "let into a groove sunk in the floor of the dam, in "such a manner that the frames, when laid flat, "do not project above the bed of the stream.

"The frames are maintained in their vertical "position by a movable bar which fits down upon "them and serves to keep the blades closing the "waterway in their positions at the top; at the "bottom the blades fit into a groove made in the "floor of the passage. They are of wood from "4 to 5 inches wide and are pressed against the "top bar by the weight of the water, the height "of the frames may vary from 4 to 10 feet; their "distance apart is made equal to their height with "a small allowance for play. M. Poiree estimat- "ed the expense of such dams at about 40 £ per "yard run."

This is a valuable model exhibiting an important improvement in the construction of moveable dams; and it is on this account well deserving of commendation.

Among the models of the works of navigation are—

A lock and dam across the Munneyaur in Tanjore useful as exhibiting what has been done, but it has no features of novelty.

The Shediancoopum Lock: this is a substantial work; the only circumstance worthy of particular notice is that there are two sluice shutters in each gate raised by means of pinions working in upright bars toothed at their upper extremities and attached below to the shutters; by means of these simple sluices the Chamber can be filled and emptied in a comparatively short time, a very important advantage in Locks in Canals along which there is much traffic; there is however nothing novel in this arrangement.

There are two models of Canal boats from the Delta of the Godavery.

1st. An Officer's paddle boat.
Length of Model 4'— 4"
Breadth of Beam 1 — 1

It has two Cabins the first one provided with seats and cushions and capable of being easily converted into a convenient sleeping appartment; the second Cabin is in the stern; the men who work the

paddles stand in the space between the two Cabins; the diameter of the paddle wheel is 11 inches; there are ten paddles to a wheel, each paddle consists of two boards each 3 inches by $\frac{3}{4}$ of an inch.

There is no scale given with this model.

2nd. Model of the Dowlaishweram and Cocanada Transit Boat.

Length of Model	9'— 0"
Breadth of beam	1 — $0\frac{3}{4}$
Depth	0 — $6\frac{3}{4}$
Height of Cabin above side of boat	0 — $6\frac{1}{4}$

The great advantage of this description of boat is that it can be used either in Canals or in the broad water of the rivers and can be worked where-ever the most ordinary coolies can be procured. They are in great use by the Engineer Officers of the Godavery Division who live in them when moving about their districts. They do not attain a speed of above $3\frac{1}{2}$ or 4 miles an hour but as fresh coolies can be had in every village they can be worked day and night and will complete in four and twenty hours a voyage of 60 or 70 miles.

The model is nearly flat bottomed, it has a sail 20 inches in height by 42 inches in breadth and a mast rising $28\frac{1}{2}$ inches above the Cabin; it has 5 Cabins.

In the boat of which this is a model on a scale of $1\frac{1}{2}$ inches to a foot the dimensions of the first Cabin must be about 7 feet by 5 feet; the second must be 7 feet by 7 feet; these two appear to be private Cabins they are fitted up with seats and Cushions, and have venetian windows and doors.

The third Cabin must be about 12 feet in length 9 feet in width and 6 feet in height, it is not so comfortably fitted up as the first; it has seats along the sides of the boat, and instead of venetians it has only canvass blinds.

The fourth Cabin must be about 24 feet in length $7\frac{1}{2}$ feet in width and 6 feet in height; it has venetian windows, seats and cushions.

The fifth must be about 7 feet in length 7 feet in width and 6 feet in height.

There is a gangway about $1\frac{1}{2}$ feet in breadth going along each side of the boat by means of which all the Cabins can be communicated with.

The voyage from Cocanada to Dowlaishweram, a distance of 36 miles, is made in 10 hours and the boat charges are as shewn below. By night in 10 hours, distance 36 miles.

The first Cabin with two beds &c. &c. &c. 200 lbs. of baggage and one servant.	2 0 0
Second Cabin with two beds 200 lbs. of baggage and one servant	1 8 0
Third Cabin with two beds 200 lbs. of baggage and one servant	1 0 0
Single Cabin passenger with 200 lbs. of baggage	half the above rate.

General Cabin passenger with 50 lbs. of baggage each 3 Annas for 36 miles, or 12 miles for one Anna or one Pie per mile.

The comfort, and economy of these boats are alike striking; two passengers in the best Cabin with a quantity of light baggage make the voyage during the night with none of the usual annoyances of a Palankeen journey, at a charge of 2 Rupees each, while their servants are carried at 1-12th of an Anna a mile or 3 Annas for the whole voyage and within call at any moment.

The boats are used by all classes, but the greater profits are made by the cheapest passengers and so cheaply are the vessels worked that while passengers are carried 12 miles for an Anna, the Company owning the boat have divided 30 per cent. per Annum.

There are two models of wind-mills.

The first is exhibited by Captain McNeil, B. A., Civil Engineer, it is applied to the purpose of raising water by means of an endless chain and Buckets; the diameter of the Circle within which the sails revolve is 29 inches; there are 8 triangular sails each of which has a base of 10 inches and an altitude of $12\frac{1}{4}$ inches.

The motion of the main shaft is first transmitted by a pinion moving in a vertical plane to a large toothed wheel moving in a horizontal plane and then by means of another pinion which is attached to the axis of the wheel just mentioned and which moves with that wheel in a horizontal plane, to two large wheels or drums over which two endless chains traverse.

The second is a simpler mill having only four sails the motion of the main shaft is communicated by a large wheel moving in a vertical plane to a pinion moving in a horizontal one, the axis of this pinion is common to itself and to the mill-stone, so that the two necessarily revolve together.

DOPPING'S SHUTTER.

This is a model on a scale of two inches to the foot; the shutter closes a vent between two piers, the vent in the model is 10 inches by 10 inches; the shutter revolves on a vertical axis, which divides it into two equal parts the water pressing upon which has no tendency to cause motion in either direction as the pressure on one half of the shutter exactly balances that upon the other; when it is necessary to open the shutter a sluice provided for the purpose in one half of the shutter is opened, this operation diminishes the surface exposed to pressure on one side of the axis causing the other half of the shutter to yield to the pressure of the water and open the sluice.

This shutter has been tried in the head sluice to one of the Channels from the Paulaur Annicut, it was found to answer very well when the supply of water was moderate; it has not however been tried during freshes; it is a simple and ingenious contrivance and, if found to answer in all states of the river, may be generally adopted with advantage.

"The Jury consider this model deserving of "honorable mention."

There is another shutter but, in the absence of a description, its mode of action is not apparent.

Model of a Truss Bridge on the American principle.

This is a model of a Bridge designed on the principle adopted by the Engineer of the Utica and

Syracuse Railway in the United States, it is on a scale of an inch to a foot: the roadway is supported on three trusses dividing it into two parts, each 12¼ inches in width, the span of each truss is 93 inches and its height 10¼ inches.

This model was exhibited by Mr. D. Parker, Civil Engineer, in the employ of the Madras Railway Company.

There is a model of a Truss Bridge by Mr. R. Kennedy, Civil Engineer; it has two trusses, each consisting of upper and lower string pieces connected by vertical ties and further stiffened by inclined struts; a curved rib is attached to each truss.

The roadway is carried along the top of the trusses; the bridge of which this is a model has a single span of 60 feet, the depth of its truss is 6 feet and the breadth of its roadway 7½ feet; it crosses the Eastern Coast Canal about two miles South of the Adyaur; the scale of this model is an inch to a foot.

There is a second model by Mr. Kennedy of a somewhat similar bridge it differs from that described above in having fewer vertical ties, and in having its roadway resting immediately on the lower string pieces instead of on the upper ones: it spans 60 feet, has trusses each 6 feet in depth, and a roadway 6½ feet in width.

There is a third model also by Mr. Kennedy, it is of the brick bridge which carried the Guindy and Adyaur road over the Sadras branch of the Eastern Coast Canal.

Monsieur Louis Guerre, Chief Engineer to the French Government at Pondicherry, has exhibited a model of a Head Sluice, it consists of a bridge of five arches, each of which is fitted with a timber framing and shutters by means of which the whole of its waterway may be closed. No scale is attached to the model; each arch spans 5½ inches, each shutter frame is 3⅝ inches by 1¾ inches, the breadth of the roadway is 3¼ inches.

A wooden suspension bridge is exhibited by Colonel A. Cotton, it was made up at the Mint it spans 50 feet and has a verse sine or dip in the centre of 4' 2" or $\frac{1}{12}$ of the span: it consists of 7 chains formed of slips of teak, connected by pegs: the links of each chain are alternately of single and double slips, a link made of a single slip is thus connected at each end with a link made of two slips: in order to give the bridge uniformity and to distribute the strength equally, the chains are so made that when placed side by side in the bridge the double slip link in each chain lies between two single slip links one on each side of it: the chains being thus arranged the roadway may either be placed directly on them or suspended, as may be required; in the model a rough roadway of bamboos was placed immediately on the suspension chains.

The Section of each of the slips of which the suspension chains are made is 2 inches by 2 ins. the pegs by which these are connected are each ½ an inch in diameter. An experiment was made to test the strength of one suspension chain, the pegs first used were of teak, and then of bamboo, but in both cases they gave way with a weight of about 200lbs. placed on one chain which is equal to 1,400 lbs. for the whole bridge: Iron pins were then put in and ½ a ton was put on one chain, this weight brought the posts to which the chain was attached at each end over very gradually but did not cause any injury either to the pins or the slips: this weight of half a ton for one chain is equivalent to 3½ tons for the whole bridge—this experiment proves that two or three bandies might pass over such a bridge with safety: it was however incomplete as it did not fully test the strength either of the pins or of the slips as the posts gave way before sufficient strain could be brought upon these. As to the sufficiency of the slips there can be no question as their aggregated Section amounted 10 × 2" × 2" = 40 square inches which would safely bear a direct tension of 20 tons; and it would require more than 10 tons placed on the bridge to produce this tension on the slips: the strain on a bridge spanning 50 feet and having a roadway 10 feet in width is generally taken at about 50,000 lbs. or about 23 tons, if it be situated in a Town; but a bridge of the kind here described is only supposed to be used through Jungles where timber is plentiful and traffic scarce: or it might be used some times by troops on a line of march. A bridge of this description would answer admirably for the passage of rapid nullahs which intercept communications while flooded and stop the traffic. A chain made with pins of some wood well suited to the purpose would answer well for a tappal bridge, but in most cases it would be better to use iron pins, for which the common bolt iron ⅝ inch in diameter would be suitable.

The model of a Coffer Dam appears to be the same as that exhibited at the last exhibition, and described in the Jury report on that occasion.

List of articles for which 2nd Class medals are awarded.

Catalogue Number.	Name of Article.	Name of Exhibitors.
	Wooden Suspension Bridge.	Colonel A. Cotton.
	Pump for clearing foundations by low lifts.	Mr. Overseer Lever.
	Dopping's shutter.	J. H. Dopping, Esq. Civil Engineer.

List of models deserving of Honorable mention.

	Model of the Kistnah Annicut.	Captain Farewell, Executive Engineer.
	Model of the South branch of the lower Colleroon Annicut.	W. Cadell Esq. Sub Collector, Tanjore.

These are the principal ones: but it may be said that all the models are deserving of Honorable mention.

F. C. Cotton,

Chairman and Jury.

Class VII.

Report by Lieut. O'Connell, *Engineers.*

CLASS. VIII.

NAVAL, ARCHITECTURAL AND MILITARY ENGINEERING, ORDNANCE, ARMOUR, AND ACCOUTREMENTS.

His Excellency General Sir P. Grant, K.C.B.
Major General Craigie, C. B.
Colonel P. Hamond, *Reporter.*
Lieutenant Colonel G. Balfour, C.B. *Reporter.*
H. D. E. Dalrymple, Esq.
Colonel F. A. Reid, C.B.
Colonel F. P. Haines.
Captain W. C. Baker, *Reporter.*
Lieutenant Colonel G. Talbot.
Major G. Rowlandson.
Major F. H. Scott.
Captain C. Biden.
Colonel Æ Shirreff.
W. Eaton, Esq.
J. J. Franklin, Esq.
Lieutenant Colonel C. A. Denison.
Lieutenant Colonel C. A. Browne.

Military equipments having been fully reported on with reference to the Exhibition of 1855, it is unnecessary to enter into further details connected with Artillery carriages, which in that year as well as in 1857 were the principal articles of Military equipment in the Exhibition. The arms however form a marked feature of interest; and as there are many interested in the arms of this country, it seems advisable to give a detailed description of each article, and it is only by minute description that they can be properly illustrated. With the object therefore of doing justice alike to the contributors and the contributions, each article of importance receives a separate notice, and although this form of reporting will make the report of Class VIII assume somewhat the appearance of a *catalogue raisonnée*, it is believed that this form is best adapted to the articles to be described.

There are several very valuable collections of arms, deserving notice; and we would recommend the award of 2d Class Medals, and certificate of honorable mention, to the Exhibitors as follows:

To the Right Hon'ble Lord Harris for a valuable collection of arms of all descriptions, consisting of weapons superior in quality to those commonly found in private collections.

To the Hon'ble W. Elliot, for a collection of arms of great variety.

To R. Burgass, Esq. for a collection of arms of various countries.

To Captain Campbell, for his models of carriage and Tilting Hammer.

The collection of arms from Kurnool also deserves honorable mention.

5565 Auger's Fuze brace with bit made at the Grand Arsenal; workmanship good, fully equal to the English made article, but likely to be superseded by an improved and more handy excellent little frame Auger proposed by Captain Bower.

4937 to 4940, 5567, 5568, 5569 to 5574 Guages of 6 sizes, 2 in a set, for ascertaining the fitness of projectiles with reference to high and low windage, for 24 p. to 68 pr; of a good model, all well turned out, and if correct as to guage, very creditable to the workshops of the Gun Carriage Manufactory, Grand Arsenal and Vellore, where they were made. A machine for testing their sphericity and accuracy should be provided; rates of cost at which made, very moderate.

198 Screw Jack Double Traversing from Pondicherry.—A very strong and powerful machine for lifting heavy carriages or other heavy articles, such as large stones, heavy logs of timber; deserving special notice, the workmanship good and substantial.

9311 The Campbell Hammer.—A very ingenious invention intended for forging very large axles and drawing large pieces of iron for cheeks of Iron Gun Carriages; also well suited for driving piles made up by Captain Campbell, Commissary of Ordnance at Bangalore.

3091 Carriage iron for 10 inch iron howitzer made at the Gun-Carriage Manufactory, exhibits the great diminution of surface to the enemy's fire by the use of iron as compared with wood. Well adapted for the field.

5468 Shot round iron 32 pr. cast at the Indian Iron Company's works at Porto Novo: sphericity good, casting clean, and very fair as to weight and guage; these are well reported upon in the Grand Arsenal.

5466 Musket Rifle, Percussion, bore, 577 of 1853, with Bayonet. This arm is considerably lighter than the old Brown Bess, and the barrel rifled, having 3 shallow groves, has an immense range being sighted up to 900 yards; it is secured to the stock by means of 3 iron bands, the nose one serving to hold the steel rod securely in the groove; these bands passing over the stock and barrel are kept in their places with springs. The lock is of the swivel pattern, the actions free. The bayonet, a most deadly weapon, differs from that formerly in use, the blade being longer, and having three grooves; the way in which the bayonet is secured to the barrel is also different, by means of a ring of iron round the socket, which on being moved from right to left passes under the nose sight making a fixture for the bayonet.

4975 Pistol Revolver.—An imitation of Colonel Colt's well known weapon; barrel not rifled, action far from perfect. The maker by increased care could without doubt in guaging the various parts, turn out an efficient and superior weapon. Exhibited by Serjeant Hayes, Gun Carriage Manufactory.

5558 to 5560 Tier Sheet or Coffin's Grape.—Plates cast at the iron works of the Indian Iron Company, Porto Novo, for 18, 32, and 56 Pdrs. The Plates are well cast, and well secured by the iron spindle, and sheet securely fastened.

5467 Shot heating Machine.—Made up in India from an English Pattern; parts cast at Porto Novo, Indian Iron Company's Work. Portable and well adapted for the Field.

ARMS FROM KURNOOL.

56 Sword called abbassee, tiger faced handle, gold gilt, enameled, having a fine Damascus curved blade, in red velvet scabbard with rich mounting.

57 Sword called Khandah; the handle gold gilt richly chased, the blade of watered Damascus steel, in blue velvet scabbard, handsomely mounted.

58 Sword, with handle beautifully wrought in the shape of an elephant's head, the trunk forming the guard, inlaid with stones; the blade curved, of fine Damascus steel, in blue velvet scabbard richly mounted.

59 Sword called abree abassee, has a fine Damascus blade square back ⅔ of its length, ending with a double edge, the handle of steel finely inlaid with gold, and red velvet scabbard.

60 Sword, called Sorabee, having a richly worked handle in gold gilt, with beautiful lace worked straps and emerald tassels; the blade is fluted and inlaid, and the scabbard of red velvet has gold gilt mountings.

61 Sword abassee, Damascus blade greatly curved, has a richly worked handle, gold gilt, and red velvet scabbard.

62 Sword aseel; the blade, of well tempered Damascus steel, is set in a gold gilt handle; scabbard red velvet with gilt mountings.

63 Poignard Bunk or Beechwa; the blade of fine steel, well wrought, has a handle of red ivory richly mounted in gold gilt, and purple velvet scabbard beautifully mounted.

64 Knife Karobee, Damascus blade in gold gilt handle, and green velvet sheath richly mounted.

65 Steel cap; good and substantial workmanship.

66 67 Steel cap and Steel breast called charnia. Helmet of steel, has an ornament in form of an arrow on the top; a curtain of steel rings is attached to protect the neck.

68 Pair of Armlets, or Gauntlets, made of fine steel inlaid with gold, and lined with red velvet.

2465 Fowling Piece from Salem, exhibited by Mr. Causaker; barrel of the ordinary quality of a low priced English piece; a plain sound gun, stock of a good looking hard wood.

2466 Walking Stick gun from Salem exhibited by Mr. Causaker.

1364, 2467, 4970 Gun Locks from Salem, Bellary, and Gun Carriage Manufactory, are fair plain pieces, of work, evidently made from English patterns. The springs are single, not nearly so good as the double springs.

ARMS FROM HYDERABAD.

6151 Poignard, Damascus blade, having two deep grooves running up the centre, giving it a light appearance; white ivory handle, and leather scabbard.

EXHIBITED BY THE HONORABLE W. ELLIOT, ESQ.

An interesting group of ancient weapons among which are several beautifully mounted Poignard Knives, Swords, &c.

24 Poignard, having a crystal handle, the blade Damascus steel, and a sheath with richly chased silver mountings.

2 Sword, the handle, of good workmanship, is inlaid with gold; and the blade, a very fine one, is greatly curved.

8 Sword, the handle of steel large and silver plated; the blade a long fluted one, is well tempered.

25 Coorg knife; the knife having an agate handle, blade of fine steel, has a strong back inlaid with gold.

28 Dagger; the handle richly chased, forms a case in which are deposited a set of drawing instruments: it has a yellow velvet scabbard.

36 Poignard; the blade is of Damascus steel finely wrought, fluted, and splendidly inlaid; the handle, of ivory, is set with stones, and the scabbard (of red velvet) is mounted with gold gilt open work.

46 A curious dagger; the blade being of watered steel; in wooden sheath.

There are among this lot several swords, the blades of which are fluted, and one elaborately chased representing animals.

Two Knives having finely carved ivory handle, are well worthy of notice.

There are 3 Flint lock Pistols having the barrels inlaid with gold, and the stock with Ivory.

Two curious swords with long handles, intended to be used by both hands.

A three bladed dagger; the handle curiously formed of deer horn.

Three Boomerrangs made of hard wood.

There is one curious old sword, the blade of which is long and straight, set in a long steel handle serving as an armlet; a vast amount of labour must have been spent upon this, as it is almost one mass of inlaying, the metal used being silver. This sword appears to be adapted for thrusting only, as the arm used in striking a blow would most likely be injured.

There are two swords the blades of which gradually widen to the point like a harlequin's wand. One of them has a false back rivetted on; they are old specimens, but have been costly, both having the handles inlaid.

Rifle match lock, contributed by Major Simpson; curiously carved, and has a beautifully figured Damascus twist barrel, which is secured to the stock by brass bands and having a steel ramrod.

The following Articles were arranged as a trophy; comprising a leather shield of good workmanship, inlaid; having two plates forming a breastplate. A broad sword, the handle inlaid with gold, the scabbard blue velvet.

Two swords, the blade of one broad; handle inlaid with gold, the scabbard of blue velvet; the other sword in leather scabbard has an ivory handle.

EXHIBITED BY R. BURGASS, ESQ.,

A lot of swords, 30 in number, some of Indian manufacture, but chiefly English of the last century; many have finely tempered blades, steel basket hilts, and most of them are in a state of good preservation. Among this lot is an Indian short sword, the blade beautifully inlaid, and the handle elaborately chased Also 4 dress swords, 2 having the handles inlaid; the blades of fine steel, very light, and fluted the whole length. One blade of fine Damascus steel, has a broad back standing out considerably from the level of the blade, which is short. There are 5 other blades without handles; several of very excellent Damascus steel, are greatly curved and long: one sword, the blade of which is light and curved, is of fine Damascus steel; and the handle (of silver) is beautifully chased, as are also the mountings of the scabbard, which is covered with leather.

There are 2 double handed swords, one with the handle chased with brass, and the other with a handle of wood covered with purple velvet; the mountings are of silver chased, and the scabbard is also covered with velvet of the same colour similarly mounted.

One Sword has an ivory handle inlaid with silver; the blade, of fine Damascus steel, is inlaid with gold, and the scabbard of purple velvet is silver mounted.

A short Sword with plain steel blade broad back, has a groove up the centre; the handle is buck-horn, silver mounted, and the scabbard (of leather) is also silver mounted.

A Knife with the handle silver enamelled, has a blade of the best kind of Damascus steel having a furrow on either side about one third of its breadth from the edge, but reversed on each side so as to equalise its strength; the sheath of figured velvet.

A curious native Bayonet, with a short broad blade engraved.

A Helmet of steel, finely inlaid with gold, having an arrow of steel on the top for ornament. It has a curtain, made of steel rings running round to protect the neck.

EXHIBITED BY THE RIGHT HONORABLE LORD HARRIS.

8474 Sword blade of Konasummunder of fine Damascus steel.
8475 Do. do. do.
8476 Carnatic matchlock gun, the barrel neatly inlaid with gold, and the butt with ivory.
8477 Carnatic matchlock gun, the barrel long, with bill nose, and steel ramrod.
8478 Do. do. do.
8479 Strait sword with Goopthee handle, silver gilt; in red velvet scabbard, having a well tempered blade: the handle curiously wrought.
8480 Broad sword with Goopthee handle, and inlaid; Damascus blade.
8481 Do. do. do.
8482 Native bayonet with short blade, having a ring to the socket, as now used in the Enfield Rifle of the pattern of 1853.
8483 Straight sword; Damascus blade, the handle inlaid, and red velvet scabbard.
8484 Straight sword, handle inlaid, with yellow velvet scabbard.
8485 Spear, the handle finely inlaid with silver; blade 3 square, long, and also inlaid; having a red velvet scabbard, and handsome tassels.
8486 Saw sword, handle gold, with gilt leather scabbard; the blade double pointed.
8487 Broad sword tapering, with gold gilt handle, the blade having a broad back and bevilled edge.
8488 Sword with handle beautifully inlaid with gold; having a curved Damascus blade in green velvet scabbard.
8489 Do. do. do. do.
8490 Sword with handle inlaid with gold; having an excellent blade much curved.
8491 Sword with gilt handle, and long grooved tempered blade, in red velvet scabbard.
8492 Sword with gold gilt handle, finely wrought in the shape of an elephant head; having a curved Damascus blade in blue velvet scabbard.
8493 Battle axe with gold gilt handle; the head finely inlaid.
8494 Do. do, wooden handle silver mounted, the head beautifully inlaid with silver.
8495 Leather shield with lace work strap.
8496 Dagger, with handle gold gilt; in yellow sheath,
8497 Do. do. inlaid with gold, the blade having a curious device worked in relief.
8498 Dagger, silver gilt, in red velvet sheath.
8499 Do. with 2 blades, in red velvet sheath.
8500 Peishcubz or waist dagger, with green ivory handle, blade inlaid and purple velvet sheath.
8501 Peishcubz finely worked, with gold gilt handle, and green velvet sheath neatly mounted.
8502 Poignard or Beechma with ivory handle, fine well finished Damascus blade, and red velvet sheath.
8503 Do. do. do. good blade inlaid with silver, in red velvet sheath.
8504 Do. do. do. with Damascus blade, and silver gilt sheath.
8505 Knife, with ivory handle, the blade of fine Damascus steel, in silver sheath finely chased.
8506 Sword with handle inlaid with gold; Damascus blade and leather scabbard, with steel mountings.
8507 Sword with the blade long, and greatly curved; in ivory handle.
8508 Small sword with emerald handle; the blade finely inlaid with gold, in yellow velvet sheath.
8509 Goopthee sota, a curved kind of dagger.
8510 Steel sota, with iron tube handle containing a chain to which a pronged head is attached.
8511 Tubber with highly finished gold and silver gilt handles, into which a knife screws, with axe head spear, and soug finely inlaid.

8512 Tubber similar to the last, in red velvet sheath.
8513 Soug or spear head with steel handle.
8514 Steel sota, the head composed of 8 blades.
8515 Tubber knife with steel head beautifully inlaid with gold, the handle silver gilt; into which a dagger screws; and yellow velvet sheath richly mounted.
8516 Tubber with silver gilt handle similar to the last.
8517 Dagger with curious inlaid handle, and Damascus blade in red velvet scabbard.
8518 Poignard or Beechma, the handle finely inlaid with gold, and good Damuscus blade with red velvet sheath.
8519 Curiously wrought taper blade, with broad steel handle and red velvet scabbard.
8520 Peishcubz with red ivory handle, and highly finished blade, in yellow velvet sheath with richly worked mountings.
8521 Dagger in broad steel with open worked handle, in leather sheath.
8522 Dagger with fluted blade, in red velvet sheath.
8523 Dagger, with curious broad silver gilt handle, and finely wrought Damascus blade, in yellow velvet sheath.
8524 Coorg knife in red velvet sheath.
8525 Chand Soorooj, sun and moon.
8526 Simotha dagger or nut cracker, also forming a dagger when the handle is reversed.
Pair of Armlets.
8527 Pair of shoulder flaps, lace worked, with steel shields in centre.
8528 Helmet with feathers.
8529 Covering for the chest or breastplate.
8530 Covering for the back, or black plate.
8531 Waist belt lace work.
8532 Pair of aprons.
8533 do do.
8534 Shield with lace work strap.
8535 Broad sword, in yellow velvet scabbard.
8536 Large Peishcubz, handle worked in gold, and purple velvet scabbard.

The last 10 lots form a very interesting group, the shoulder flaps, waist belt, and aprons being of velvet, worked with lace and spangles; the helmet, armlets, breastplate and back plate, of well wrought steel inlaid with gold in a superior style, and lined with green velvet worked with lace and spangles in a beautiful manner, the whole workmanship of this group is highly meritorious.

CLASS IX.

REPORT ON AGRICULTURAL AND HORTICULTURAL MACHINES AND IMPLEMENTS.

JURY.

Colonel F. A. REID, C. B.
G. S. HOOPER, Esq. *Chairman.*
H. F. C. CLEGHORN, Esq. M. D.
A. J. ARBUTHNOT, Esq.
Captain C. H. DRURY, *Reporter.*
R. KENNEDY, Esq.

The first item of this class is represented by a few models from Hyderabad, of the primitive kind of implement in general use in all the cultivated districts of the Presidency, consisting of ploughs, drills, and clod-crushers or harrows.

No advancement appears to have been made in this Department since the Exhibition of 1855.

The little interest displayed by the Natives of India in instituting or promoting improvements in the present system of cultivation, although doubtless partly to be ascribed to their general dislike to innovation of any kind, may more fairly be considered generally attributable to the want of the necessary means on the part of individuals to avail themselves of a better style of implement.

Those now in use are adapted to the powers of the draught cattle, few and wanting in strength, kept by cultivators for agricultural purposes. The plough is therefore made as light as is consistent with any useful purpose, a single bar of iron or steel serving for share and coulter: the furrow made by it being so shallow as to tax but little the strength or endurance of the oxen. Any improvement therefore in the shape or make of the plough would, while adding to its efficiency, increase its weight, and while enabling it to turn a deeper furrow, would, to meet the increased resistance, necessitate the employment of a better breed of cattle or a larger team, both beyond the means of the poorer and more numerous class of ryots, supposing them able and willing to pay for an improved and more expensive implement. It is moreover believed that deep ploughing has not been found to answer in India.

The Horticultural tools, with the exception of a few rough specimens used by the poorer class of native gardeners, though not numerous, afford good samples of such as are in every day use for gardening purposes. Those from the Fort St. George Arsenal, comprising mattocks or mahmoties, hoes, rakes, forks, hedge clippers &c., are well made and serviceable tools.

The Vellore Arsenal furnishes a strong well wrought spade, and Mr. Causaker of Salem contributes an ingenious implement which might be made serviceable in light gardening work, combining the uses of the pick axe, mattock and spade.

It is to be regretted that the skill of local artisans should not be represented in a class of implements so likely to prove highly remunerative to the makers in the larger towns and stations of the Presidency.

C. H. DRURY,
Reporter.

MADRAS,
11*th May* 1857.

CLASS X.

REPORT ON PHILOSOPHICAL INSTRUMENTS AND PROCESSES DEPENDING UPON THEIR USE, MUSICAL, HOROLOGICAL AND SURGICAL INSTRUMENTS.

JURY.

Lieutenant Colonel A. McCALLY. *Chairman.*
Major W. K. WORSTER.
Major W. S. JACOB, *Reporter.*
A. BLACKLOCK, Esq.
W. J. VANSOMEREN, Esq., M. D., *Reporter.*
Dr. W. FLYNN, G. M. M. C.
B. CUNLIFFE, Esq.
Captain J. W. HAY.
Lieutenant Colonel G. TALBOT.
P. ORR, Esq.
H. W. PORTEOUS, Esq.

The Jury in introducing their report regret that they can only repeat the sentiments of the Jury on this class in the Exhibition of 1855. The very small present demand for Philosophical, Surgical, Musical, and Horological Instruments in this country, accounts both for the limited extent and inferiority of their local manufacture, and the class is consequently very poorly represented in the Exhibition, so far as Indian-made articles are concerned. Several English-made Instruments are exhibited, but these, being enumerated in the catalogues, need not be severally particularised here—none of them presented any novelty or special excellence.

I. *Five Dials on one block* were exhibited by *Sub-Conductor Skinner*. Only one of these is a correct indicator of Time—in the other four the gnomons are misplaced.

II. *An universal Sun-dial* from Hyderabad—is plated and well executed, but presents nothing new in principle. It merits *honorable mention.*

III. *A small dial* from Hyderabad—is constructed for the latitude of that city, but has nothing particular to recommend it.

IV. *A Meridian dial* is old in principle and rudely constructed.

V. *A dial* by Messrs. Jenkins is exhibited.

VI. *A Spherometer* by Liebhaber. This is an ingenious instrument but imperfectly executed—the centre-screw works loosely in its nut—the micrometer head and scale are not numbered—and the steel rim being liable to rust, must furnish another source of inaccuracy and award a 1st Class Medal.

VII. *A Balance* by Sub-Conductor Skinner, is defective in the suspension of its pans, and scarcely turns with a quarter of a grain.

VIII. *A Chemical Balance* by Liebhaber, exhibited by Major Simpson, appears well constructed. It is said to indicate to three-thousandths of a grain, but in the absence of both key and weights the Jury were precluded from testing its accuracy.

IX. *Two Compasses*—one in a silver case and one in brass—are rather rudely executed and priced sufficiently high.

X. *A pocket case of Surgical Instruments*—is very inferior.

XI. *Several fracture-splints* and a *Salter's Fracture Cradle* made in the Gun-Carriage Manufactory are well turned-out.

XII. *A common Bugle* by Swamy of Madras.

XIII. *A common Bugle* by Swamy of Vellore.

XIV. *A Light Infantry Bugle* by Savigrey.

XV. *A Cavalry Trumpet* by Swamy.

W. S. JACOB,
W. J. VANSOMEREN,
Reporters.

CLASS XI.

TEXTILE FABRICS AND COTTON MANUFACTURES.

JURY.

W. E. UNDERWOOD, Esq., *Chairman.*
W. U. ARBUTHNOT, Esq.
E. LECOT, Esq.
Major J. MACDOUGALL,
R. O. CAMPBELL, Esq.
H. CRAKE, Esq.
W. BOYTON, Esq.
R. W. NORFOR, Esq.
T. L. R. SHAND, Esq., *Reporter.*

The Cotton manufactures submitted at the present Exhibition, vary but little from those shewn in 1855 : they are far less numerous, and inferior in quality and dye. The textile fabrics of the Madras Presidency are considered by the Jury to be very imperfectly represented. The Jury fail to perceive any marked improvement in any branch of the various manufactures which they have inspected. The suggestion made in the last report that " no prizes or medals" be granted, except for some new manufacture or very superior sample of ordinary " manufactures" should be adhered to, on the present occasion, with the hope that some marked novelty in the style, and getting up of some of the staple productions of the Presidency, be induced.

Two pieces of fine Punjum Cloth, forwarded by Gooroo Pariah of Rajahmundry are very wonderful specimens of Native skill, and of the extraordinary degree of fineness and evenness of weaving attained by the native hand looms. They are made from thread spun by the hand. The Jury desire to record their admiration of the above specimens which are priced at Rupees 100, one at 180. Similar specimens were exhibited at the last Exhibition.

A piece of Rajabader Cloth sent from Nellore by Pitcheca Ramalinga Chetty priced Rs. 26 is considered by the Jury as entitled to favorable notice.

Pondicherry has again taken an advanced position amongst the various contributions. The Napkins and Table Cloths are deserving of praise, but the Jury cannot perceive any superiority over those specimens formerly exhibited. The Towels numbered 7189 are however worthy of especial notice, being of a most useful description and of excellent style and manufacture. Those numbered 8009 without name, are also deserving of commendation though inferior to the Pondicherry specimens.

The contributions of dyed goods are few in number, and inferior in quality, and the Jury are unable to specify any particular article as deserving of special notice except those undermentioned.

A piece of Trowser check cloth from Mr. P. Martin, Cuddalore, is deserving of approbation, the pattern being of a particularly neat design, and tastefull chosen for an article of wearing apparel. The cloth is strongly and evenly woven, and the Jury consider this contribution to be entitled to honorable mention.

Seram, from Chingleput, cloth numbered 8015 is, on the whole, a favorable specimen of dyeing.

A gold embroidered Palempore from Masulipatam is worthy of notice as a fair specimen of gold embroidery but much inferior to the specimens exhibited in 1855.

A Damask table cloth contributed by the German Mission at Mangalore is entitled to favorable notice, but the damasking is rather of a confused character which however may improve under use.

South Arcot.—The damask Table cloth from Ragavelloo Chetty 9148 is considered by the Jury as worthy of favorable notice though the specimen numbered 7871 manufactured at Madras is by far the best article of manufacture that has been submitted to the notice of the Jury, and they would recommend the Exhibitor of this specimen to receive a second class medal.

Nellore.—A piece of Jean sent by Pitcheca Ramalinga of Nellore priced Rs. 10 is a useful description of goods and deserves approbation.

T. L. R. SHAND,
Reporter.

JURY AWARDS.

2D CLASS MEDAL.

Catalogue No.	Names of Exhibitors.	Objects rewarded.
7871 Entered in the Catalogue by mistake as Marool fibre.	W. E. Underwood, Esq.	Table Cloth.
8391	Pitcheca Ramalingum [Chetty.	Cotton Cloth Rs. 26
8400	Do. do.	Jean 10

HONORABLE MENTION.

Catalogue No	Names of Exhibitors.	Objects rewarded.
2392	Gooroo Pariah.	Punjum Cloth Rs. 100.
	Pondicherry.	Table Cloth and Napkins&c.
8009	Name unknown.	Towels.
9140	Mr. P. Martion.	Trowser Cloth.
7145	German Missin.	Table Cloth.
8015	Chingleput Jail.	Bluedyed Trowser Cloth.

CLASS XII.

WOOLLEN AND WORSTED.

JURY.

Lieut. Col. A. M'Cally, *Chairman.*
Captain J. W. Hay.
J. Kellie, Esq.
J. T. Maclagan, Esq.
W. R. Arbuthnot, Esq.
P. Veerapermall Pillay.
Sirdar Jung Bahadoor.
Hajee Aga Mahomed Bakir Sherazee Nemazee.
Major Nicholls, *Reporter.*

To

Colonel A. M'Cally,

President of Jury on Class XII.

Madras Exhibition of 1857.

Sir,—I do myself the honor to submit Report of the Jurors on Class XII (Woollen and worsted) of which you are President.

Cumblies.—Amidst the variety exhibited the palm must be awarded to the Tahsildar of Koodlegee Talook, Bellary. The Cumbly sent by him measuring 10 × $3\frac{1}{2}$ Cubits, and priced at Rupees 9-3, was by far the finest and best specimen, in the opinion of the Jurors fairly entitling him to a 2d Class Medal. Those forwarded by the Hyderabad Local Committee, by C.Humpiak, Bellary, Kistnahsawmy Iyengar, Mysore, Captain Balmain, Raichore Dooab, Captain T. Clerk, Mysore, D. Cotappah, Bunder and Captain Russell, Kurnool, are severally worthy of notice.

Blankets.—Three—two of Mundium Wool, and the third, of the Wool of a half bred Merino exhibited by Captain Loudon, Assistant Commissary General,—Mänufactured at Hoonsoor—priced, the former at $2\frac{1}{4}$ Rupees each, the latter at 3 Rupees. The Jurors consider that a creditable approach to the European manufactured Blanket has been attained there is however still room for improvement, the defect to be remedied consists in a want of softness, the nap or fluff having a nearer resemblance to Hair than Wool.

Shawls.—A Worsted embroidered shawl exhibited by W. E. Underwood, Esq., manufactured at Madras, the Jurors would make very favorable mention of ; and recommend that the Exhibitor receive the thanks of the Committee, and the manufacturer be awarded with a 2d Class Medal.

Mixed Fabrics.—Four Pieces, of different colors, manufactured by Thresher and Glenny of London, from Wool and Cotton, the produce of India, sent to England by Dr. Ratton. The Jurors are of opinion that the result is highly satisfactory as regards the wool, the produce of this Country they would suggest that a trial should also be made of working up the Wool *alone,* The texture of these fabrics is fine, the Article light, soft, adapted for Summer wear, but apparently not very durable.

In the absence of a classified List or Catalogue I prepared one containing, I believe, every Article exhibited in this Class (XII.)

I have the honor to be,

Sir,

Your most obedient servant,

H. J. Nicholls, *Major,*

Reporter, Class XII.

Madras Exhibition of 1857.

CLASS XIII.

SILK AND VELVET.

Jury.

The Hon'ble Sir C. Rawlinson, Kt.
H. A. Murray, Esq. *Chairman.*
W. E. Cochrane, Esq.
Colonel J. L. Stephenson,
Major A. C. Silver.
C. Lutchmenarasoo Chettiar.
R. W. Norfor, Esq. *Reporter.*
J. Binny Key, Esq.
Hajee Aga Mahomed Bakir Sherazee Nemazee.
J. Broomhall, Esq.
J. Deschamps, Esq.

In submitting their report of that portion of the Madras Exhibition of 1857 which has been assigned them for scrutiny and comment, the Jury of Class XIII have pleasure in stating that the display of manufactured silk is such as to give the greatest reason for hoping that in every important silk-producing district of this Presidency the manufacture is in a state of improvement, and needs but care in the several localities to secure a great extension of trade, and consequently much material prosperity to the people.

Particular notice will be taken of each locality, but generally the Jury has been led to the above conclusion by the richness and beauty in color of some of the Hyderabad Silks, the useful character and the cheapness of those of Mysore, and the evident desire for improvement in the already good quality of those of Tanjore, shown by a departure from the old patterns and an endeavour to weave such as will command a general market.

The prices upon the silks exhibited seem to be the retail rates, and consequently though they afford a guide, they do not offer a full one, to the rates which these goods could be sold at by the wholesale producer. With the exception of those from Mysore the Silks cannot be styled cheap, but there are some from Hyderabad of great width and beauty the prices of which lead to the supposition, that, if made narrower, and without borders, they might compete in price as well as in quality, with any that could be brought forward, the borders which add much to the expense of the fabric, are useless for European wear. The colors of most of the silks are such as to call for unqualified praise, but the range of color is very limited, and it is evident that the happy combinations, both in dyeing, and in weaving, by which in Europe such extraordinary beauty and delicacy are imparted to the fabrics, are still unknown to the Indian manufacturer, instruction and care in these respects are much needed. The blacks in all cases are bad.

Of the Satins exhibited the Jury regret that they cannot give a favorable report, there is hardly a piece that deserves to be called good, and those that are superior to others are injured, as all are, by a dressing applied to the back, with a view of giving a seeming substance to the fabric. This practice should be at once discontinued, and the manufacturers should learn that by no amount of dressing, can a good Satin be formed where its original quality is defective.

It seems very desirable, if any great extension of trade is sought, that a standard of widths and lengths for different descriptions of Silk should be adopted, the widths recommended, are 24 and 36 inches, the former principally for dress Silks, and the latter for plain white silks for export, the length to be 48 yards, and 7 and 9 yards, according to the description of Silk woven.

The Jury would direct the attention of producers to a branch of trade which might become one of great profit, viz. the manufacture of plain white Silks for Export to Europe, similar but superior to those manufactured in Bengal under the name of Corahs, in length of 7 and 9 yards : the great complaints of the qualities of these Bengal Silks seem to open a door for the introduction into the Home market of a class of goods calculated in their quality to meet the demands of the trade, and the cheap rates at which it is evident that Mysore can put out its manufactures, seems to shew, that, in this branch it can enter into successful competition with the Bengal weavers.

As a guide to all that the Jury have recommended above, they would advise the obtaining immediately samples of silks of the manufacture of France, England, Bengal, and China, and that these should be exhibited in the several

districts, with an estimate of the prices that might be obtained for them, and that manufactures should be urged to try their hands at producing like goods in some cases, and excelling them in others.

The present amount of mechanical means may suffice, but the introduction of simple machinery where it may seem needed should also be had in view.

For the carrying out of the above suggestions, the Jury think that the Local Committees would cheerfully afford their aid, and so endeavour to give a practical effect to the exertions they have already made in furtherance of the objects of the exhibition.

It will be observed that the attention of the Jury has been given to the extension of the Silk manufacture for European use, it is probable that for native use the supply already equals the demand, and that in their richness and beauty of fabric the products of the looms of South India already furnish all that rank and opulence can desire, but even in this home trade it is by no means unlikely that the introduction of European models may work changes that may have their effect beyond a simple change in the style of the garments used.

MADRAS.

A most perfect specimen of weaving is exhibited in imitation of China *Pina Silk*, this piece made under the orders of Mr. W. E. Underwood is a counterpart of the Pina Silk made in *China*, it has been produced from Mysore Silk in a native loom of the kind commonly used for fine weaving, the imitation in texture and appearance is most exact, and does honor both to the capacity of the workman, and to the discernment and perseverance of the originator.

A small piece of Tusser Silk from the same gentleman, shows that with care this silk can be well made in Madras, the sample is uneven in texture.

HYDERABAD.

Attention is recommended to the preceding remarks, many numbers of these silks are particularized in order to render the decisions of the Jury useful to the manufacturers. In the Hyderabad Silks the hand of the skilled workman is clearly discovered, and it is hoped that much time will not elapse ere they possess the advantages of European models for silks intended for European wear; the borders and ends are in most cases very handsome, and as a whole the display is most creditable. Though as before remarked the satins cannot be praised, yet the qualities made are sufficient to show that much better can be produced.

VERY GOOD.

6076 A Crimson plain Silk suited for dresses if made in proper colors.
6078 Shot Crimson do.
6081 Plain Crimson.
6083 White, the only piece, attention called to remarks respecting weaving of white silk.
6088 Green stripe and border Texture excellent, would come into use for dresses if made in proper colors and without borders.
6228 Crimson, Superior in all respects.
6464 Crimson Silk, moderate in price.
6465 Crimson Silk.
6469 Do. particularly good, color and texture.
6472 Crimson Silk, would take the place of China Silk if made without border for furniture.

GOOD QUALITIES.

6077 Stried Silk.
6080 Crimson.
6092 Yellow, a Creditable Silk.
6094 Yellow, bad color but silk good, made in good colors would sell, not dear.
6094 Orange do.
6094 Orange do.
6996 Yellow, Handkerchiefs—pattern inferior.
6224 Crimson and Blue Shot stripe, rather uneven in texture.
6463 Crimson Silk.
6507 Crimson and Yellow Stripe if woven in English patterns would sell.
6510 Striped Silk, good substance, but apparently mixed.
6511 Green and Black stripe.
6514 Crimson and Black check.
6531 Crimson.
6532 Yellow and Black, mixed, cotton and silk.

MIDDLING QUALITY.

6262 Crimson stripe corded.
6416 Crimson black check, a harsh silk.
6515 Green and black check, mixed.
6517 Green, much too dear.
6534 Green, check faulty.

Besides all the above, there are 18 pieces of rich Crimson silk forming the Canopy.

It will be observed that all the superior silks are Crimson, and the Jury notice this the more particularly as bearing out their recommendation that a close attention should be given to the dyeing art in the Hyderabad districts. The Reds are excellent, but there is only one piece of merit in any other color, viz. the green.

SATINS.

6098 Inferior Satin.
6099 Do.
6241 Do.
6343 Crimson—middling.
6344 Green and Crimson stripe—better.
6345 Fair texture but wanting color.
6348 Red and yellow—middling.
6351 Crimson—Inferior.
6351 Scarlet and Black Stripe—a better article.

6350 Scarlet and yellow—a bitter article.
6353 Green and White—middling.
6353 Inferior.
6354 Crimson and Black Stripe—fair texture wanting color.
6355 Inferior.
6357 Ordinary.
6358 do.
6359 Crimson Stripe—fair, rather coarse.
6360 Inferior.
6361 do.
6384 Crimson Stripe—Inferior.
6394 Green do.
6359 Inferior.
6396 Ordinary.
6396 Pink and Black Stripe, middling.
6397 Green—bad.
6398 Inferior.
6399 do.
6399 Red Stripe. Color good.
6399 Red, do.
6400 Ordinary.
6401 Yellow Stripe, middling.
6402 Red and white do.
6403 Green, fair.
6404 Crimson Color, good, texture creditable, injured in dressing.
6405 Yellow, fair.
6407 Scarlet, bad.
6410 White flowered, a fair attempt at style, texture coarse.
6609 Crimson flowered, Color bad, coarse.

TANJORE.

These silks in this section particularly deserving notice are Nos. 2673, 4677 4679 5175. The attention of Tanjore manufactures is called to the remarks of the Jury, and every hope is entertained of a great advance in the production of these Silks.

4673 Green and Crimson, shot, recommended to be be made in good colors without border. Hurry Row.
4677 White Silk, Hurry Row: this silk shows that the white silks recommended to be made can be well made in Tanjore.
4679 Red and white squares, very good silk, requires only change of pattern and its manufacture in modern colors to make it very saleable.
5175 A flounced Dress Piece, the only thing of the kind in the Exhibition, deserves the highest praise; the style is plain, but it is evident that this first step, if well followed up will lead to rapid improvement. If made in other colors would be very saleable.
4668 Red and Yellow, recommended to be made in good colors without border.
4669 Green and Yellow stripe—good texture.
4670 Good native cloth.
4671 Red and white squares, very good silk, requiring only change in pattern.
4672 Recommended to be made in good colors without borders.
4680 Handkerchiefs very creditable.
4681 Good native cloth, mixed.
4633 do. ,,
4684 do. ,,
6160 Buff twilled—this in suitable colors would be a most useful silk, G. Soobroy Chetty: this man could make white silk for export.
5174 Sashes. As imitations creditable but require much improvement.

MYSORE.

The Jury in their general remarks have noticed the promising nature of the Mysore section, one great point, that of cheapness combined with quality has been attended to, and if persevered in, must be followed by remunerative results. The patterns here require modernizing and some change in texture is also necessary, whilst at the same time the present should be continued. Great attention to the important art of dyeing is necessary, the silks also are too narrow. Mysore exhibits no White Silks, but looking to the qualities and prices of its colored fabrics it could certainly take a leading place in a general trade in these.

4234 Black and Crimson, good and cheap, recommended to be made in colors suited for European wear.
4235 Three pieces in Colors—bad taste.
4236 Five pieces Check—deserving notice from their peculiarity above others and their cheapness, but recommended to be made of more durable substance.
4237 Two pieces, require improvement in quality and color.
4238 Check, requires greater taste in pattern, quality good.
4239 Four pieces Shot, and others, quality middling.
4240 Inferior but cheap, mixed.
4268 Check requires better taste.
4270 do.
4271 do.
4272 do.
4275 Black very bad color, mixed.
6812 Woman's cloth, good and cheap.
6830 do.

SALEM.

2400 Man's cloth, material and texture very good, price moderate.
2392 Woman's cloth, good and cheap.
2393 Handkerchiefs—quality inferior, color bad.
2500 Cloth of middling quality.
2501 do.
2502 do.

ADONI.

1900 Wanting in quality.
1912 Good substance, thread badly spun. Cloth uneven, price moderate.
1915 Wanting in quality.
1916 ,,
1917 ,,
1918 ,,
1919 ,,

BELLARY.

2008 Native cloth, coarse and dear.
2010 do.
2011 do.
2013 White, very uneven.
2015 Silk cholay, well made, good colors.
2021 ,, middling.
2023 ,, ,,
1024 ,, ,,
2027 Mixed Silk and cotton, middling.

CHINGLEPUT.

776 Native Cloth, nothing to recommend it.

VATAPOLLIUM GUNTOOR.

9304 Seems to have been in the last Exhibition and to have received a Medal. Very inferior to Silks now Exhibited.

MADURA.

1321 Gold and Silk Handkerchief—light texture, prettily made.

KURNOOL.

79 Orange and Red Square Cloth, indifferent.

MASULIPATAM.

4108 Two handkerchiefs—texture very creditable, cheap.
4108 Two Black—not so good.
4108 Two Blue—light texture, bad color, dear. One long ditto.

PARAMAGODY MADURA.

4751 Mr. Boalth, Moonsiff of this place, exhibits three pieces of Silk Handkerchiefs the produce of this Village, they are very good and moderate in price, Mr. Boalth says that the weavers are too poor to work otherwise than with advances, which is much to be regretted, as the specimens show that with means to do so an article could be produced that would stand well in the market.

W. R. NORFOR,
Reporter.

MADRAS, 29th April 1857.

JURY AWARDS.

MADRAS.

No. Mr. Underwood, *Pina Silk*, 1st Class Medal.

HYDRABAD.

Nos.	6228 & 6469	Silks	One First Class Medal.
	6088 & 6472	ditto	One Second ditto.
No.	6078	ditto	Honorable mention.
	6081	ditto	ditto.
	6464	ditto	ditto.
	6404	Satin	ditto.

TANJORE.

No.	5175	Dress piece,	1st Class Medal.
	4673	Silk	Honorable mention.
	4677	ditto	ditto.
	5170	ditto	ditto.

MYSORE.

No.	4234	Silk	Honorable mention.
	4236	ditto	ditto.

PARANGODY, MADURA.

No. 4751 Silk Handkerchiefs, Honorable mention.

R. W. NORFOR,
Reporter.

MADRAS, 29th April 1857.

CLASS XIV.

MANUFACTURES FROM FLAX AND HEMP.

Jury.

The Honorable Sir. H. C. Montgomery, Bart. *Chairman.*
The Honorable Walter Elliot, Esq.
W. E. Underwood, Esq.
Lieutenant Colonel G. Balfour, c. b.
H. F. C. Cleghorn, Esq. m. d.
Colonel F. A. Reid, c. b.
A Hunter, Esq., m. d.
Lieutenant Colonel T. T. Pears, c. b.
J. D. Sim, Esq.
Colonel Æ. Shirreff.
Major J. Maitland.
Lieutenant Colonel W. H. Budd,
Lieutenant Colonel A. M'Cally.
Colonel P. Hamond, *Reporter.*
Major G. Simpson,
Captain W. C. Baker.
Captain C. Biden.
W. E. Cochrane, Esq.
J. Binny Key, Esq.
W. Arbuthnot, Esq.
J. L. Lushington, Esq.
J. T, Maclagan, Esq.
A. T. Jaffrey, Esq,
E. Beaumont, Esq.
Lieutenant Mitchell, *Reporter.*
T. Peachey, Esq., *Reporter.*
Dr. W. Flynn, g. m. m. c.
W. B. Wright, Esq.
G. Williams, Esq.
N. C. Mooroogasen Moodelliar.
C. V. Conniah Chettyar.
C. Runganada, Shastree.
Sub Conductor Briggs, *Reporter.*
W. B. Liddell, Esq.
Captain Hawkes.

The manufactures from Flax and Hemp and their immediate substitutes, although not extensive, are most of them excellent specimens, and exemplify in an interesting manner, some of the many uses to which Indian fibres may be applied.

The Jury while regretting, that the scanty means and imperfect mechanical appliances of India, must inevitably retard the development of her resources, and to a great extent operate against the reception of her manufactures, whenever cheapness of production and extreme strength and perfect workmanship are indispensable; yet, view the proofs displayed of the inherent value of Indian material as extremely valuable; and they are convinced that in fibre manufacture, nothing but the instruction of the people in the English methods, and the judicious introduction of the requisite machinery are required, to enable the production of Cordage of a quality equal to, and at a cost far below the English supplies.

The production of fibre, its preparation and after manufacture, has, until lately, been very inconsiderably and unskilfully conducted, and the marked improvement now displayed in the raw material and manufactured cordage, establishes the value to be derived from periodical expositions of art and industry, and of the willingness of the native operatives to adopt European methods, when their value and usefulness are practically exemplified.

It is now almost universally admitted, that few countries can surpass India in the variety and excellence of its fibrous productions. That these have not sooner or more willingly met with acceptance by the European manufacturers is attributable, *first* to the difficulties which always

exist to the introduction of new and untried material, to the absence of information on the part of the manufacturers, as to the variety, quantity, quality, value and means of affording abundant supply of Indian Fibre, and *secondly*, to the imperfection (from unskilful treatment) of the samples and consignments forwarded to England.

The attention of many competent judges in India has long been turned to this unaccountable neglect, of what might be India's chief staple of production and export. The present compared with the preceding exhibition shews how much good has followed the endeavour to place the production and preparation of Fibrous substances on a proper footing.

The requirements of a large and populous country like India, must necessitate the use of cordage varying from extreme cheapness and simplicity of manufacture, to the expensive and trustworthy descriptions at present only procurable in Europe.

That the higher requirements of the public service cannot be satisfactorily supplied from local resources is easily accounted for, and is not at all surprising when the total want of capital and machinery and the little skill of the native manufacturers are considered. Whenever danger to life or property might follow the employment of inferior cordage, the use of the Europe manufacture is imperative ; and this, less from the inferiority of the material employed in this country, than from its imperfect manufacture occasioning uncertain quality and irregular strength.

There is however ample evidence to justify the expectation, that when skilled labour and fitting machinery are employed, the working up of Indian Fibre into cordage equal to the English, is not only possible, but also, that the English will be surpassed in durability and strength, from the superior fitness of the Indian fibres to resist the effects of a tropical climate.

In the specimens of cordage and twine examined by the jury, they observed that chief care had been bestowed upon those Fibres*, which experiment have proved the best material for cordage. The more common, available and cheaper materials† are represented in a less ambitious form. The latter manufactures are interesting as shewing how cheaply and easily the agricultural requirements of the country can be supplied.

*Coir. Cocos nucifera.
Aloe. Agave species
Marool. Sansiviera zeylanica
Yerkum. Calotropis gigantea
Ambaree. Hibiscus cannabinus
Jute. corchorus
† Wild date. Phænix dactylifera
Palmyra. Borassus flabelliformus
Seemay cattalay. Fourcroya gigantea
Screw pine. pandauns odoratissimus

In the higher samples of native manufacture, the jury remark how evidently the production of superior samples has been the work of time and labour to the enhancement of the cost: and yet how unfitted they are to compete with the machine produced fabrics of Europe. With but few exceptions, the fault so common in native rope when manufactured in imitation of the English, viz, too great a twist, hardness and consequent weakness, is observable ; and the unevenness of the *strands* in many of the specimens, shew how insufficient the native methods of manufacture are, to ensure equal strength, or to bring out the full value of the material employed.

It is a question worthy of consideration, whether encouragement afforded to the production of superior native manufactures is likely to prove advantageous, while the sole means of production is by hand labour. The common requirements of the native population have been satisfactorily supplied by the rough and cheap manufactures of the country ; and although improvement is commendable, it is very doubtful whether the greater cost occasioned by such improvement, would be appreciated, or prove remunerative. No solely native manufacture carried on in the present unscientific and desultory manner, would be acceptable in the higher requirements of the public service,—the mechanical means of England can alone ensure abundance of supply, equality and cheapness ; in the existing social condition of India, no vents exist for the costly productions of hand labour.

While viewing, therefore, the samples of cordage manufacture, as evidence of the fitness of the Indian material for such employment, the Jury cannot award to the manufactured specimens the credit of representing a true and legitimate branch of India's industry. Excellence of workmanship is apparent in many, but no proof exists that extensive demands could be met, or that equality with the samples would be certain.

Great credit is due to all who have interested themselves in the exemplification of this branch of manufacture, and though it is to be regretted that the obstacles to a cheap and abundant supply of many very valuable among the samples are too great at present to render them of commercial importance, yet the proofs shewn of the excellence of the material employed, and its fitness for manufacture under more favorable circumstances, will be of great value and eventually fulfil the purpose for which their exhibition was intended.

Of all the fibrous productions of India, the Coir (*Cocos nucifera*) holds in native estimation the highest place : whether employed in the form of rough twine for trying on the roofing of huts, to fasten the rude equipments of the native plough and cart, or to withstand the hurricane as a cable it is found equally useful. Its extensive employment for secondary purposes in the Public Service and Marine is well known. The best Coir is procurable from the Laccadive Islands but being chiefly imported to, and worked up on western coast, the principal supply for Southern India is derived from the indigenous plant. The specimens of Coir Cordage are very good, and though none

are of large size, the samples from Tanjore alone, are sufficient to shew its applicability for every purpose to which Cordage is applied, and its value as a cheap and useful manufacture, if the aid of machinery were brought to bear. Coir, from specimens shewn in the form of rugs and carpets, dyes freely, and this property suggests the applicability of the material for many of the requirements of social life.

From the light colour of most of the Indian Fibres, they are well adapted for dyeing, and many which, from the shortness of the staple are useless for Cordage, would prove valuable material in the manufacture of Carpets, Mats, Rugs &c, and particularly for the flooring of Railroad Carriages. An immense amount of Matting is required by public Institutions in Europe, and for Railway Stations, Waiting Rooms, Offices &c. and which are at present mostly covered with a superior but very expensive description of Cocoanut matting, some of which is worked up with hemp. Many of the far cheaper Indian Fibres might prove equally useful, and the Jury are anxious that experiments may be instituted to discover the best material for these purposes.

The "*Agave species*" is represented by contributions from most of the Districts, and appears also a favorite material with the Native manufacturers; its applicability for the finer kinds of twine is well known. The fineness and length of the fibre from the young leaves, enables the production of a superior description of Cordage, but its tendency to rot, when exposed to moisture has proved a serious drawback to general use. Science and experiment may yet discover an antidote for this failing, and should such be the case few fibrous substances offer greater advantages for general manufacture. The *A. Americana*, appears best suited for Cordage and the *A. Vivipari* for woven fabrics. Many of the samples forwarded have been dyed of various colours, and appear well adapted for Punkahs, lamps and other internal uses in houses.

Marool " *Sansiviera Zeylanica*" is but lightly represented in a manufactured form; the chief exhibitor being Hurry Row of Tanjore. Good Cordage from Cuddapah and Guntoor is shown and a serviceable looking line from Masulipatam. Dr. Kirkpatrick forwards from Bangalore some excellent twine. The dyed Ropes from Tanjore are very good.

Palmyra. " *Borassus flabelliformus*" though useful as a material for common Cordage does not appear to promise much if employed for the superior descriptions. A few of the samples of Rope forwarded have been carefully got up.

Wild date, " *Phœnix dactylifera*," is useful for agricultural purposes; but two samples of rope have been forwarded.

Hurry Row forwards from Tanjore a specimen of Cordage from the Plantain Fibre: this beautiful material is however too costly for Cordage but admirably adapted for weaving.

Yercum," *Calotropis gigantea*." Good specimens of Cordage are exhibited by the Local Committee Masulipatam, Messrs Fischer and Co. of Salem and Dr Kirkpatrick; the value of this fibre, if machine treated, is well known.

Sunn or Janapa, " *Crotolaria Juncea*." This is one of the most useful of the Indian hemps and is largely exported to England. Some good Cordage is exhibited by the Masulipatam Local Committee.

Ambaree, " *Hibiscus Cannabinus*," is represented in a manufactured form, by the Local Committee Masulipatam, Messrs Fischer and Co. of Salem and by L. Paupiah in Gunnies; the latter manufacture is the finest specimen in the Exhibition. Gunnies would make excellent corn sacks, and would afford them at a much lower price than is now paid at Home.

Some specimens of Rope manufactured in the Arsenal at Secunderabad from " Ambaree " and other of the Deccan Fibres deserve especial notice as strikingly exemplifying the value of scientific treatment in the manufacture of Cordage. In the early part of 1856, Captain Barrow and Dr. Riddell instituted a series of experiments at Secunderabad with the Deccan Fibres, and carried on the manufacture with native Rope makers. The Rope thus manufactured and tested at the Grand Arsenal, Madras, gave the following results :

Hingoolee Sunn,	Fibre	4½ inch		Broke with	3272	lbs.
Ellichapore Burro,	do	4½ do		do	3933	lbs.
Do Ambaree,	do	4 do		do	2657	lbs.
Hingoolee Sunn,	do	3½ do	tanned	do	1256	lbs.
Do do	do	3½ do	not tanned	do	3441	lbs.
Do Ambaree,	do	3½ do		do	3609	lbs.
Ellichapore Ambaree	do	3½ do		do	2701	lbs.
Hingoolee Sunn,	do	3 do		do	2165	lbs.
Do do	do	2½ do		do	2713	lbs.
Do Ambaree,	do	2½ do		do	2209	lbs.
Ellichapore do	do	2½ do		do	2097	lbs.
Do Probaree,	do	2½ do		do	2153	lbs.

A second experiment carried on with the assistance of a European Rope-maker and with machinery improved under his directions as far as the resources of the Arsenal would admit, gave still more favorable results.

Ambaree	5	inch	Broke with	9167	lbs.
Do.	3½	,,	,,	5117	,,
Do.	3	,,	,,	4407	,,
Do.	3	,,	,,	1720	,,

The Jury while considering the samples of Rope from Secunderabad as the most perfect manufacture in this class, still view the purpose for which the Exhibition was established as intended to encourage and display the native industry of the country; and the above samples having been produced by European agency and with every assistance the resources of an extensive Arsenal could afford, cannot be placed in competition with the unaided efforts of native industry. Great credit is due to all concerned in the manufacture of this Rope, and the experiment is truly valuable as proving the great worth of Indian Fibre when properly treated. Considering, however the care and

attention bestowed, and the fact that it represents the only legitimate manufacture in this Class, that any amount of supply can be obtained, and that the purpose of the manufacture is to remove the prejudice existing against the raw material, and to shew the capabilities of the Country for carrying on manufactures if the requisite mechanical agency and trained skill be introduced; the Jury recommend that a first class medal be bestowed on Captain Barrow and Dr. Riddell and this high award being supplemental to the rewards the Jury propose for the superior manufactures in this Class, no injustice will be done to the other competitors.

A very superior description of Cordage, manufactured in the Arsenal at Bangalore is also shewn, but not equal to that from Secunderabad; the manufacture is very good, but the material employed does not appear equal in strength or well cleaned.

Allusion has been made to the large requirements of the Railways in Europe. There is one manufacture extensively required by them, viz. Canvas for making Tarpaulins wherewith to cover loaded Wagons. If any of the coarser kinds of Indian Fibres could be made up, of great breadth, of a texture that would resist the wet, retain the paint, bear folding up and knocking about, and the alternations of heat and cold, wet and dry, at a moderate price any quantity might be taken; the average cost of a Wagon Tarpaulin is in England 21 Rupees.

Of the finer Fabrics there are but 12 specimens contributed by two Exhibitors, viz.

W. E. Underwood, Esq.
Hurry Row, Tanjore.

W. Underwood Esq. has shewn the best manufacture and finest article produced, from two Fibres. viz. * Marool. *Sanseviera Zeylanica* and one said to be, † Pine Apple. *Ananana Sativa*—as the prices are not affixed, it is impossible to decide on the merits of these fabrics as Articles of Commerce. The Pine Apple cloth is particularly beautiful, and would, if it could be produced at a reasonable rate, command a ready sale. The Marool cloth too, if it dyes well, might be very extensively used.

* Nos. 7871. 9072.
† Nos. 7870.

Hurry Row exhibits.

Marool	at	Rs. 5.7.0	per yard	No. 4698
Pineapple	at	Rs. 7.7.0	per yard	No. 4704 4705
Do.	at	Rs. 3.2.6	per handkerchief, ...	No. 4707
Plantain	at	Rs. 1.10.0	per do.	No. 4709
Agave Americana	at	Rs. 4.0 7.	per yard	No. 4701
Yercum	at	Rs. 9.12.0.	per yard	No. 4708

All these prices are too high, and can only tend to preclude the possibility of the manufactures obtaining a market in Europe, where equally good and infinitely cheaper fabrics are produced, although the first cost of the material and the labour in preparing it for manufacture, must occasion large outlay.

It is much to be regretted that the specimens in this class and of this description of fabric, are so few, as without doubt the flax spinners of Ireland, Scotland, Belgium, Holland and Germany must ere very long seek for Fibre elsewhere. Flax is the most exhausting crop that grows, on which account landholders, especially in the north of Ireland are prohibiting the cultivation of it, and in England the growth of flax has been prohibited for years and is made in most cases penal, involving the forfeiture of the Leases of the parties raising it. In India it might be produced in abundance, and there does not appear to be any valid or sufficient reason, why, with land so much cheaper, and the cost of labour so trifling, the Fibres of India, some of which equal, if they do not surpass, the best of Europe, should not with a little encouragement care and perseverance become a large and constantly increasing item of export from this country.

The Jury would be glad to see more strenuous efforts made to improve the Canvas manufactures of the country; and would point out to all interested in the manufacture of cordage, the necessity of employing none but good and well cleaned fibre. They must remember that it is easy by hand labour to make good looking rope, but that such, if of unequal strength, or not of the strength made the standard in Europe, is useless for the higher requirements of the country. Attention should also be turned to the many valuable and cheap preservatives procurable in the country. Tarring Cordage in this climate is highly detrimental, and any fermenting preparations inadmissable. The use of some of the metallic salts would prevent rot, resist insects &c,. and some of the oils might prove of great benefit as preservatives.

The Jury recommend the following prizes be awarded.

To W. E. Underwood Esq., for the best fine fabrics, a 1st Class Medal.

To Hurry Row of Tanjore, for his fine fabrics, and very extensive contribution in this Class, a 1st Class Medal.

To S. Paupiah, for his very excellent Gunnies, a 2nd Class Medal.

and supplementary, and for especial approval, to the Secunderabad Rope a 1st Class medal, and the Jury suggest that the General Committee should take means to ascertain that the reward in this instance is given to the true producer.

CLASS XV.

REPORT ON MIXED FABRICS INCLUDING SHAWLS BUT EXCLUSIVE OF WORSTED GOODS.

JURY.

The Right Hon'ble Lord HARRIS.
M. GALLOIS MONTBRUN.
J. KELLIE Esq.
S. D. BIRCH, Esq.
W. E. UNDERWOOD, Esq.
R. O. CAMPBELL Esq., *Reporter.*
J. TAWSE, Esq., *Reporter.*
Major STEWART.
P. VEERAPERMALL Pillay.
Sirdar JUNG BAHADOOR.
HAJIE AGA MAHOMED BAKIR, SHERAZEE, NEMAZEE.

In the Madras Exhibition of 1855 there was a fair display of Cashmere shawls which added much to the attractiveness of this class of Articles. On this occasion, however, the object being in a great degree restricted to the exhibition of the products and manufactures of this Presidency, and less encouragement having been given to the display of the costly manufactures of other parts of India none of the shawls of Cashmere or indeed of that description of manufactures are represented, and, as many of the most gorgeous and expensive of the mixed fabrics of this Presidency, consisting of Silk and gold floor cloths, table covers and saddle cloths and trappings, come under the designation of Tapestry and Embroidery and are dealt with in another class, the articles exhibited in this class consist principally of the beautiful Silk shawls and bed quilts of Mysore; of men's and women's cloths of cotton and silk, and cotton with gold embroidery from different parts of the country.

Silk Shawls of Bangalore.—Of these there was a very good display, showing considerable variety of pattern, the brilliancy of color, weight of material and softness of texture excited admiration. The range of prices was from Rs. 80 to Rs. 125.

The handsomest shawl was exhibited by Naikjie Sookaram No. 4,223 priced at Rs. 115. As is generally the case in these shawls the border was sewed on so as to exhibit the right side at both corners when folded for wear. The Jury considered this shawl entitled to pre-eminence, on account of the novelty of the pattern (a rare recommendation in native manufactures) and the beauty and harmony of the colors, and awarded for it *a Second Class medal.*

Another shawl exhibited by Koday Tooljee No. 4217, priced Rs. 125, similar in size to the above but of a more ordinary pattern and on which the colors were not so well harmonized attracted the notice of the Jury and they considered it worthy of *honorable mention.*

Silk Bed quilts.—These were also of Bangalore manufacture very similar in texture and style to the shawls and, like them, not in one piece but consisting of different pieces sewed together. The Jury did not consider any of these so remarkable as to deserve the distinction of a meda,l but they deemed the following entitled to honorable mention.

No, 4,216	priced Rs.	75	Exhibited by	Coday Tooljah.
4,218	„ „	100	„	Dondalai Esorsee.
4,222	„ „	80	„	Naikrjee Sookaram.
4,224	„ „	100	„	Maikjee Munyapah.

A black Silk embroidered shawl of Chinese manufacture exhibited by *Miss Tatham* attracted great admiration, the embroidery in red silk being of the most perfect workmanship, alike on both sides, and covering the whole shawl. The Jury awarded a medal (second class) to the Exhibitor.

Men's and Women's Cloths.—Of these there was a very large and handsome display principally from Hyderabad, but also from the Mysore country, from Bellary, Chingleput, Madura, &c., In this description of garment, however excellent the manufacture there is little variety of color or style to attract the eye or call for special remark; accordingly there was only one which the Jury considered entitled to a second class medal. This was a red women's cloth from Conjeiveram No. 778 exhibited by Moonased manufactured of silk and gold. The weight and value of material and the elegance of design excited admiration.

The cloths of cotton and silk transmitted by the Hyderabad Exhibition Committee from Salar Jung Bahadoor and also by the Hyderabad Local Committee were numerous and good, and the assortment was considered entitled to honorable mention. There were also two cloths which attracted the notice of the Jury for their simplicity and elegance, viz.

No. 6,023 a Sadu of cotton with gold border and 6,103 a do. of silk and cotton both exhibited by the Hyderabad Local Committee. These were also awarded honorable mention. Likewise a woman's cloth from Bellary No. 2,007 exhibited by G. Narrappa, ornamented with a rich border of silk and, lace was considered worthy of honorable mention.

The Jury hope by awarding their commendation principally to improvements in pattern and style and to judicious departures from the stereotyped fashion in these universally used articles of native apparel into the manufactures to give their attention more to such improvements.

JURY AWARDS.

Progressive No. in Catalogue.	NAMES OF EXHIBITORS.	OBJECTS REWARDED.
	2nd Class Medal.	
4,223	Naikjee Sookaram,.........	Silk Shawl.
9,087	Miss Tatham,...............	Embroidered Silk Shawl.
778	Moonasee,..................	Woman's Cloth Silk and gold
	Honorable Mention.	
3,217	Koday Tooljee,.............	Silk Shawl.
4,216	do do	Silk Red quilt.
4,218	Dondalia Esarsee,..........	do.
4,222	Naikjee Sookaram,..........	do.
4,224	Meikjee Mungapah,..........	do.
	Salar Jung Bahadoor, ...	Men's and Women's cloth.
	Hydrabad Local Committee	do.
6,023 } 6,103 }	Hydrabad Local Committee	Sadee or Woman's cloth.
2,007	G. Narrappah,...............	do. with lace border.

R. O. CAMPBELL, *Reporter.*
J. TAWSE, *Reporter.*

CLASS XVI.

LEATHER, INCLUDING SADDLERY AND HARNESS, SKINS, FUR, FEATHERS AND HAIR.

Jury.

His Excellency Lieutenant General Sir P. Grant, K. C. B.
Lieutenant Colonel W. G. Woods.
The Honorable Sir H. C. Montgomery, Bart.
Captain T. Thompson.
Captain R. W. Raikes.
Lieutenant Colonel J. Hill.
S. D. Birch, Esq.
Captain H. A. Hope.
Colonel Æ. Shirreff.
Major G. W. Y. Simpson, *Reporter*.

At a moment when the manufactures of this Presidency are in a transition state, passing from the old unaided manual labour system to all the great advantages conferred by the introduction of Steam Machinery, it seems imperative that one of the most important should not be overlooked. The manufacture of Leather in this Presidency, whether regarded with reference to the requirements of the Public Service, or in a commercial point of view, is scarcely second to any other manufacture either in extent or importance; but, before entering on the question of Tanning it may not be uninteresting, or uninstructive, to submit a brief sketch of the Exports of Hides and Tannin substances, shipped at Madras for the last 3½ years. Commencing with the years 1853-54 the number of untanned Hides exported, chiefly to England, Holland, and France, was 2,36,876, with a money value of 1,33,295 Rupees. In the years 1854-55, there were shipments of 24,95,463 Hides with a value of 6,42,035 Rupees; and in 1855-56 the exports were 12,38,079 Hides valued at 3,71,736 Rupees, exhibiting a total number of Hides exported during the last 3½ years of no fewer than 60,03,086, of the estimated value of Rupees 24,71,379; it has before been observed that the largest exports have been made to England, Holland, and France, and to these may be added Arabia, Persian Gulf, the Indian French Ports, Scinde, and, strange as it must appear, to Bengal for re-shipment to North America; looking to these facts it is unquestionable that this Presidency possesses within itself the most ample means for meeting all its requirements so far as the supply of Raw Hides is involved; and, in concluding these remarks, one very striking fact may be added, that the declared value of the Hides exported from Madras, during the month of February last, reached the very large amount of Rs. 2,04,996; and in March last, Rupees 1,63,754; and the marginal quotation from the "Times" of the 9th March, gives reason to expect that still larger exports may be looked for. Turning now to the means for converting Hides into Leather, we find within the Presidency rich and abundant Tannin substances at our command, and to show how fully the value of these substances is appreciated elsewhere, it is necessary once more to refer to the export trade of this Port.

First taking the Tannin substances, catechu, cutch, terra japoninca, and terra, all terms, in general use with Tanners to designate one and the same substance, but not accurately so, for catechu,

The annexed Extract from the Leather Trade Report at *New York* dated January last corroborates the impression that the consumption of Hides is exceeding the supply both in the Home and American Markets.

The Leather Trade in America.—Hides and leather have lately gone up to a higher figure than at any previous time within the memory of our oldest boot-wearers. Buenos Ayres hides, the best quality in market, now sell for 34½ cents per lb., while last June the price was 23 cents. This is a rise of fully 60 per cent. in eight months, though the present supply is not less than usual at this season of the year. There has been a gradual advance in the price of hides since 1849, when the best quality could be bought for eight to nine cents.

Home LeatherTrade.—Since our last report both leather and hides have become more scarce, and a further advance in price has been realized. The opinion which has been frequently expressed—viz., that the consumption of leather is now greater than the production, is fully confirmed by the actual decrease in stock, and the anxiety of buyers to replace sales. The accounts by the last Brazilian mail report a greatly diminished supply of hides to this country, which circumstance has caused a considerable advance in all descriptions of sole leather.

The Brazils.—Hides much inquired after, and stocks on hand insignificant; sales have been effected at 400 reis per lb.

for dry and 360 reis per lb. for dry salted, which, at the exchange of 28d, is equal to about 13 40d. per lb. for the former, and 11·73d. per lb. for the latter, free on board, without freight.

is the inspissated aqueous extract prepared, not only from the Bark and wood of the "Acacia catechu" and "mimosa catechu" but also from "Uncaria Gambir." The *Bombay* Catechu being obtained from the former, and the *Bengal* Catechu, from the latter. The Bombay produce is of a dark brownish red colour, and is stated to be the richer of the two in Tannin. The Bombay variety is commonly called "Cutch," while the Bengal produce of a lighter brown colour, is termed "Terra."

Bengal Catechu.	Bombay Catechue.	
97......	109	Tannin.
73......	68	Extractive Catechuic Acid.
16......	13	Mucillage.
14......	10	Lime & Alumina.
200	200	

Catchu is also obtained in large quantities from Pegue, it is packed in large masses, and is noted for its excellent quality.

The Catechu exported from Madras to England, Bombay, France, and Ceylon, was in the years before referred to, that is, in

	1853-54...	484	Cwt. at	1992 Rs.
	1854-55...	1364	,,	6984 ,,
	1855-56...	2908	,,	22971 ,,
Part only of the years.	1864-57...	658	,,	2704 ,,

or in 3½ years 5,419 cwt. of Catechu valued at Rupees 34,657.

The next Tannin substance we find as an export is the "Gall nut." In the year 1853-54 the exports were...... 613 cwt. valued at 6,430 Rs.
In 1854-55 ... 5,839 cwt. .... at 7,018 ,,
In 1855-56 ... 6,866 ,, estimated at 6,891 ,,
shewing a total quantity in 3 years of 13,318 cwt. of the value 15,339 Rs. Large shipments of Gall nuts have been made to Calcutta and Bombay.

The Gall nut does not rank very high in the Home market for Tanning purposes, consequent on the presence of Gallic acid in the nuts, which although soluble in water is useless in the tanning process, being incapable of combining with Gelatine, and Gelatinous tissue like Tannin.

The next substance found in our List of Exports, "Myrobalans," is perhaps one of the best Tannins procured in this Presidency, and possesses properties equal to any Tannin substance with which we are acquainted. Again referring to the same periods—The Export of Myrobalans 1853-54 amounted to 4,144 cwt. at the estimated value of Rs. 8,477.

In 1854-55—5,217 cwt. at Rs. 7,891
Part of 1855-56—907 ,, ,, 2,232

or in 3 years 10,629 cwt. of the value of Rs. 18,600. The chief shipments of this large quantify were made to England and France.

The "Myrobalans" contain a very large proportion of astringent matter, but Tanners in using Myrobalans must guard against all circumstances which favour the conversion of Tannin into Gallic acid, which latter, as before observed, is inoperative in Tanning. Divi Divi altho' procurable also in the Presidency, and a well known Tannin in the Home Market, is not found among our exports, and it is difficult to determine to what extent it is used in local Manufacture.

The whole of the Tannin matter in Divi Divi is found in the rind of the Pod, or beneath the epidermis of the Pod. The Divi Tannin is stated to resemble that of the Gall nut, and soon enters into a state of fermentation when mixed with water. The Leather Tanned by means of Divi; is generally very porous, and exhibits a deep *brownish red* colour; if however the Tannins, Divi, and Myrobalans, be used in *closed Pits*, discoloration of the Leather is avoided. Of the peculiar qualities of the Tannin from "Thanghedee" Bark very little is known, and indeed with regard to all the Tannin substances found in the Presidency it is most needful that some systematically conducted series of experiments should be entered on, under chemical supervision, to determine their relative merits.

Average quantities of Tannin in Catechu	Per Ct.
Bombay	55·0
,, Bengal.	44·0
Kino Tanin and extractive	75·0
Nutt Galls...	69·0
Terra or Gambir......... ...	40·0

Tannin Substances obtained in Hyderabad Territory.

Cassia Auriculata ...	Wurungul
Acacia Arabica	Wurungul and Neermul.
Cassia Fistula	Armoor.
Botia Frondosa	Armoor.
Thespesia Populuca..	Armoor.

Sumach, the Rhus Glabrum, or Coriari, an excellent Tannin, seems confined to Mysore, where it is an Exotic, the Plant however thrives well and needs little care, the leaves and bark contain the Tannin. It is used in England for tanning the lighter and finer kinds of leather, and realises a good price in the English Market. A peculiarity of Sumach is that it *does not impart any color to the Leather in Tanning.* Having thus briefly referred to the Hides and Tanning substances found in the Madras Presidency, it may not be out of place to notice some of the stages of the process of Tanning, which appear least understood in local Manufacture. First to the *Liming process.* The action of the Lime is continued for too long a time, and in too sudden and in too strong solutions. To obtain a good leather this process needs the most careful supervision, it should be commenced by immersing the Hides in weak solutions, and passing them on to stronger, watching the indication of the completion of the process, that is the yielding of the Hair and Epidermis to the touch.

The *duration* of the liming being dependant on the state of the atmosphere, and the texture of the Hides. It is most important that Hides should

be *thoroughly cleansed from Lime* before immersion in the Tannin solution.

The Liming process is full of peril to the Hides in unskillful hands, as in over liming a portion of the Gelatinous tissue of the Hide is disintegrated, and removed in the form of Gelatin, or else so altered in structure as to become incapable of combining with the Tannin; the Leather produced (if over limed) is light, loose, and perishable.

Looking to the absence of skilled labour in this country it is very desirable that some other method than the dangerous one of liming should be followed. The same results may be obtained by means of acids in dilute solutions, sour milk may be effective, fermented Rice water, and some other Vegetable acidulous matters.

The greater portion of the Leather Tanned in this Presidency exhibits all the ill features of *over Limings*, and Leather too rapidly made.

In order that the animal fibre may thoroughly combine with the Tannin TIME is the one essential to produce a good leather; the Tanning process must be gradually and skilfully conducted in all its stages. It forms however no part of the Juries duty to enter more fully on the system of Tanning. Their remarks being confined to general points only, but they must observe that a *good practical Hand Book on Tanning* applicable to this country, would be of great value, and constitute the best means of leading Native Tanners to an intelligent knowledge of the work they carry on. The Jury now proceed to notice the Tanned Hides and skins included in this Exhibition, and, although several of the specimens are of a very satisfactory quality, it is unquestionable that the manufacture of Leather in the Presidency is still capable of great improvement and development.

Buffaloo, Bullock, and Cow Hides, have been contributed from the Hoonsoor Government Tannery, and from the Tannery under Mr. Coghlan, at Bangalore: from both Tanneries Calf, Goat, and Sheep skins have also been exhibited, and one Pig skin from Mr. Coghlan. The leathers of all descriptions taking the lead in this exhibition are those from the Hoonsoor Pits, some of the Buffaloo and Bullock Hides would bear comparison with the out turn of English Pits, the Goat and Sheep skins are also admirably got up, and are the only leathers exhibited which have not shewn a tendency to that *fawn red discolouration* on exposure to the air, which is one of the distinguishing ill features of Country Tanned leathers, the Jury feel gratified in awarding a 1st Class Medal to the Superintendent of the Hoonsoor Pits.

These Hides were closely rolled and kept in a *dark* part of the room. They were never exposed to the action of either Brilliant light or air, or perhaps the tendency to change might have been observed, as in other specimens less fortunately placed.

The leathers next in merit to the Hoonsoor collection are those exhibited by Mr. Coghlan from the Bangalore Pits. The Buffaloe and Bullock Hides are very well tanned, but have not preserved their colour in places exposed to the air, the Jury consider Mr. Coghlan entitled to a 2d Class Medal.

The Military saddle exhibited from the Body Guard Pits is extremely well put together, and the Leather, when first placed in the Exhibition, was of excellent color and appearance, but, since it has stood on Exhibition, the leather, has assumed the fawn red colour in common with all the tanned leathers exhibited, with the exception of those from Hoonsoor; the leathers used are of good substance, but the discolouration prevents this saddle from taking the place it would otherwise have assumed. The Jury award a 2d Class medal.

This saddle has been subjected to a far more severe trial than any other article of Leather exhibited, having been for the last 2 months placed exactly in front of a Window—by which it was exposed to the full rays of the Sun, whereas all other leather was more or less, *some altogether*, sheltered.

It is the opinion of the Tanner that no leather prepared in India could have stood such a test.

The leathers exhibited by Mr Crow are generally well tanned, some of the coloured skins exhibited by Mr. Crow are of a superior description to the ordinary productions of the local market. The two Harnesses exhibited do not appear to be superior to the usual descriptions of Harness at all times to be obtained at Madras. Some kid skins are of a fair quality, but do not admit of comparison with the kid skins of Europe, the same remark applies to the specimens of wash leather. The Jury award Honorable mention.

Noorasingadoo, at Ellore, has furnished a good variety of tanned leathers, several of fair appearance, but the time given to the Tanning process has been too brief to produce a good leather; over liming and too little time in the Tan Pits, can produce only an unsatisfactory result.

Collapa, at Bellary, has also exhibited a Buff Hide, and a fair variety of tanned skins, but the same remarks apply as above, large quantities of lime and 41 days only in the Tan Pits, can never produce a serviceable leather.

Rungiah Charloo, Sydapet, Chingleput, and Palavaram. Here again we find traces of over liming and rapid tanning, which are the characteristics of all the Native tanned leather exhibited. *A good Hand Book on Tanning* in Tamil is greatly needed.

There are several specimens of Sheep, Goat, and Deer skins, with some coloured sheep skins, exhibited by Veerasawmy Moodelly, at Palghaut, but the Jury cannot report favourably of them.

Some coloured Sheep skins from Hyderabad, exhibit good results with regard to the colouring matter used, but the tanning is not above the usual native standard.

Some Skins fairly enough Tanned have been exhibited by Meerapilla Lubbay, Chengleput, and some fair specimens by Cossey Rowl, Salem.

The Local Committee at Guntoor have exhibited specimens of Goat, Sheep, spotted Deer, and Antelope skins, and although the defects in Tanning before alluded to are found in those specimens, they are perhaps, superior to the general average of the Native Tanneries. The Jury observe some good specimens of Bear skins exhibited by J. Cotton Esq., Masulipatam.

To The Secretary Madras Exhibition 1857.

Sir,—I have the honor to represent on the part of Jury Class XVI, that to enable them to make their Report on leather of any practical value, it is necessary that information on the several points hereunder mentioned, be obtained from the Exhibitors, and to beg that the Exhibition Committee, will be pleased to adopt steps to obtain the same.

1st. The method adopted for removing the hair? if by liming, describe the process? the quantity of lime used, and the time the Hide is exposed to its action? also the method followed in removing the meli from the Hide, prior to its immersion in the Tannin solution.

2ndly. The names and distinctive characters of the several Tannin substances used? to what extent, and where procurable? the prices?

3rdly. The system of Tanning? whether the Hides are immersed in one strong solution of Tannin, or to successive solutions of increasing strength?; the time allowed for the absorption of the Tannin?

4thly. The method of dressing the Hides?

5thly. The full time allowed for tanning? that is from the commencement of the liming, to the final removal of the Hide from the Pits.

I have &c.,

(Signed) G. W. Y. SIMPSON, Major,
Reporter Class XVI.

7th March 1857.

(True Copy,)
G. W. Y. S. Major.

Detailed Statement of the several processes of Tanning and Dressing Leather as carried on by the Exhibitors.

Exhibitors.	Liming.	Removing the limes.	Tannin substances.	Tanning Process.	Dressing.
Mr. Crow......	Removes the hair by the action of lime, the lime from 10 to 15 days according to proportion of Hides, does not state how the lime is applied.	Does not state how the lime is removed from the Hides preparatory to its immersion in the Tannin solution.	The Tannin used is called in Tamil 'Auveramputtay,' other country barks are used at Madras, names not stated.	The process is commenced by immersing the Hides in a weak solution, and gradually increasing the strength, the time allowed is from 3 to 4 Months; this quick Tanning only will pay in the Madras Market, but we beg to inform the Jury that the regular process of Tanning to turn out a good strong durable leather will take 10 to 11 Months, but this process *will not pay* in a Market *where all the leathers we have to compete with are turned out under the quick system.* We have 25 years experience in Tanning.	Not stated how dressed.
Mr. Coghlan, Bangalore, ...	A solution of lime and water in the proportion of 36 Gallons of Water to each Mercal of lime, but before this a paste of lime and water ½ an inch thick is spread over the flesh side of the Hide which is then rolled up, the Lime past inside, and the Hide is then placed in the lime solution. Every 2nd day the Hide is taken out of the solution and well handled, and this is continued till the hair comes off	The lime is removed by steeping the Hide in a mixture of Bran and water, in the proportion of 2 Mercals of Bran to 10 Hides, with sufficient water to cover them. The Hide is after this again scraped on the hair side, after which it is ready for Tannin solution.	The Tannin used is called "Avaram" in Tamil. Price about 1 Rupee for 10 Mercals. It is procurable throughout the Mysore country. The finishing 'Tannin' used is 'Sumach' which is grown for the purpose near the Horse Artillery lines. The Sumach seed* in pod is used.	The Hides are first placed in a weak solution of Tannin and water, about 2 Mercals of Tannin to 10 Hides with enough water to cover them in the Pit. This solution is removed every second day and the strength of the next and each successive solution increased by half Mercal more Tannin, until the solution reaches four Mercals of the Tannin, which is the maximun. The Hides being well handled throughout this period. This process is continued for 5, 6 or 7 Months, according to the size and thickness of the Hides, the solution being removed as they become weak. For the two last days, the Hides are placed in a solution of Sumach seed in pod, and water, and about 15 lbs. of well ground Sumach is used to 10 Hides with sufficient water to cover them.	The Hides taken from the pot are well washed in clean water, and both sides thoroughly scoured with "Scouring stones," and Stricker on the Carrying Table, it is then hung up until half dry, after which the wrinkles and remaining "bloom" are taken off. Europe fish Oil is then rubbed into the grain side, and mutton fat and oil mixed into the flesh side. The Hide is then hung up again, and when dry, the Hide is finished off by rubbing in the Mutton fat and Oil into the flesh side, with the scouring stone, and the oil into the Grain side with a Woolen Cloth.

* Both the *leaves* and *Bark* of the Sumach, as also the warty excrescences under the leaves, contain Tannin.

G. W. Y. S.

Detailed Statement of the several processes of Tanning and Dressing Leather as carried on by the Exhibitors.

Exhibitors.	Liming.	Removing the limes.	Tannin substances.	Tanning Process.	Dressing.
	freely, which with Buffaloe, Calf and Pig skins is in about 8 days. The hair is then scraped off, and after washing the Hide in clean water the flesh side is curried.			Buffaloes Hides take 7 to 8 Months to Tan. Bullock,............... 6 to 7 „ Cow,.................... 5 to 6 „ Goat, calf, & pig skins 4 to 6 „	
	Not used in Tanning Cheetah, Bear, or other skins when the hair is not to be removed.	....	The same as for Hide stated above.	The skins are at once placed in the Tannin solution and handled in the usual way for one Month, when they will be half Tanned. The flesh side is then shaved, and the skins are again placed in the solution for another fortnight, they are after that taken out well washed then scoured on the flesh side, into which a mixture of Mutton fat and oil is rubbed; the skins are hung up to dry, and finished off by shaving in the flesh side. Lamb skins are put in water for 1 night in the first instance, the flesh is then shaved off and they are placed in the Tannin solution. Bear and Cheetah skins take about 2 Months to Tan. Lamb-skins about 1 Month to Tan.	
	To each Buffaloe Hide $4\frac{1}{2}$ seers of Lime, for a Bullock $3\frac{1}{2}$ seers and for Sheep and Goat's skin $2\frac{1}{4}$ seers. The Hides are first soaked in wa-			For every single Hide a solution of 45 pukkah seers of the bark, bruised into a coarse powder, with 90 quarts of water are used, the solution is mixed in a Tub and allowed to stand for a short time, during which the greater part of the bruised bark falls to the bottom, and all with the exception of a deposit of about 4 inches deep is taken out, the Hide is then placed in the Tub, either spread out, or folded up, by the latter the bruised bark about 4 inches in thickness is placed between the folds of the	

Nursingadoo, Ellore,...	ter for a day and well cleaned after which Lime, in proportion as above, is mixed with water and forms a paste and is spread over the flesh side of the Hide which is then rolled up the Lime inside, it is put into a Basket and remains one day, on the 2nd day it is immersed till folded up in a solution of Lime and Water, ½ seer lime to each Hide, it is taken out each morning & scraped on flesh side, and again placed in the solution, this is done for 14 consecutive days, on the 15th day the Hair is readily scraped off with a knife. Both sides are then pared with a knife and smoothed.	The Hide is placed in a Tub of clean water and pressed with the feet for 6 hours to take out the lime, after this it is hung up in the shades for 6 hours to dry.	The bruised bark of the "Tungady Tree" (the cassia serma) which must not be too young. The Tannin bark is sold at Ellore at the rate of 45 seers for 4 annas. The tree from which the Bark is obtained, abounds in the Jungle in the vicinity of Ellore. This Tannin produces a ruddy-brown colour after dressing.	Hide. The Hide is kept covered with the solution and should more Hides be Tanned at the same time, the same proportions of Tannin bark and water must be added, for each Hide 45 seers of the bark to 90 quarts of water; care being taken that the topmost Hide is 12 inches below the surface of the Tannin solution. The Hides are taken out every morning, and scoured for 25 minutes, they are then replaced as before. This operation is repealed for three successive days, and on the 4th day the solution having been thrown away the tub is again prepared with fresh quantities of Tannin and water as before. The Hides remain another term of 3 days, when the same removal takes place; this is done 4 times, occupying 12 days in all, on the 13th day the Hides having been well moved about in the Tub are taken out and the flesh side pared and smoothed. The whole time occupied in Tanning—that is from the commencement of the liming to the final removal of the Hide from the pit, is 27 days, that is liming 15 days and tanning solution 12 days. The Tanning process in the tub or pit occupies 13 days—This applies to Buffaloe and Bullock Hides—Goat and sheep skins are Tanned in same way, but 2½ seers of lime only for the whole process, and 22 seers of Tannin bark to 55 quarts of water, for each skin—The Skins remain only 6 days in Tannin solution—the whole time including liming is 22 days.

Detailed Statement of the several processes of Tanning and Dressing Leather as carried on by the Exhibitors.

Exhibitors.	Liming.	Removing the limes.	Tannin substances.	Tanning Process.	Dressing.
Callapa, Bellary.	The Hide after washing is folded up and immersed in Chunam and water, in the proportion of $\frac{1}{3}$ a seer of Stone Chunam to each Hide, and the Hide is exposed to the action of the lime for 12 days, it being taken out every third or fourth day and handled, on the 13th day the hide is taken out of the lime Water, and the hair is removed with a blunt knife, the inner side of the Hide is scraped with a sharp knife.	The Hide is first well washed in clean water, and then washed again in water mixed with wheat Bran, in which it is left for one day; this removes all the lime from the Hide.	"Turwar" Bark. in Tamil. ஆவாரம்பட்டை తంగేడుపట్ట. N. B. It is a shrub bearing a small yellow flower. This bark is procurable in abundance in and round the Town of Bellary. There are other Tannin substances procurable at Bellary, but not so good as "Turwar" Bark, such as the Babool Bark, Myrabolans and other.	The Hide is then placed in a solution of Turwar Bark and water, the former in the proportion of 8 seers, to each Hide. The Hide is kept in this first solution for 8 days, the solution being well stirred up every day, on the 9th day this solution is removed and fresh Bark and water in the same proportions substituted. The Hide is kept in the second solution for 10 days. On the 11th day this solution is thrown away, and fresh prepared in the same proportions, and in this 3rd solution the Hide is retained 10 days. So on to the expiration of 41 days from the commencement of "liming," The Hide is taken out of the Tannin solution and it is then ready for dressing. A fresh cow hide is worth 1 to 1$\frac{1}{2}$ Rupees, a bull hide 1 Rupee.	The flesh side of the Hide is scraped and then rubbed over with a small quantity of "Tire" or "Curd." The Hair side is rubbed with 2 pie worth of cocoanut oil, and the Hide is allowed to dry in the shade for a day or two.
	The only skins tanned are sheep and goats. The Hides of Oxen and Buffaloes are sold for exportation in their raw state.				The skins are first smoothed by exposure to the air, the flesh side is well scraped with a blunt kinfe to prevent contraction of the skin, it is then rubbed over with chalk, in which state it is placed in the Market at the Presidency, or exported. The cost of Tanning 100 skins is Rs. A. 6 Parahs Chunam 0 6

Rungiah Charloo, Sydapet, Chingleput and Palaveram.	In Tanning goat and sheep skins—the skin is immersed in a solution of 10 Mercals of quick lime mixed with water, in a pit 4 feet diameter and 4 feet deep, lined with brick and chunam. The skins 100 at a time folded up, so as to expose the flesh side to the action of the lime, are then placed in the pit, every day 100 fresh skins and 10 Mercals of lime are added, at the end of 4 days the skins first placed in are sufficiently acted on by the lime to admit of the hair and epidermis being easily scraped off with a blunt knife.	After liming the skins are placed in a tub of cold water, and well trodden on by the feet, and are allowed to soak for 4 days—this removes all the lime, and the skin is then ready for the Tannin solution.	The powdered bark of the "Cassia auriculata" in Tamil "Avaram Puttay;" it is procurable in fair quantities in the Chingleput District, especially at Streehumcottah where the Trees are large and the bark superior. Powdered Gallnuts from Cuddapah, and North Arcot, are also used. The Cassia bark sells at 12 Mercals for 1 Pagoda, and the Gallnuts at 7 Mercals for 1 Pagoda.	The skins after being cleansed from lime are passed through the successive Tannin solutions. The first an infusion of 4 Mercals of powdered "Avaram" Bark in 10 Gallons of cold water. The second solution contains only half the quantity of bark, and the 3d solution only 2 Mercals of powdered Gallnuts in 6 Mercals of boiling water, in each of these solutions the skins remain for 4 days, and when taken out are on each occasion scraped and smoothed with a knife before put into the next solution. The last solution of Gallnuts is the strongest—The whole time allowed for the absorption of the Tannin is 12 days, and the time for the whole process, from the commencement of liming to the final removal of the skins from the Tannin, is 20 days.	2 Mercals Avaram bark ... 1 12 2 Mercals Gallnuts. ... 1 0 3 Viss Gingelly Oil. ... 1 5 Chalk. ... ... 0 2 Pay of a Cooly who can prepare 100 Skins in a Month... ... ... 3 0 Proportion of Rent for Buildings... ... ... 1 1 Price of 100 Raw skins at 3½ Annas each. ... ... 21 14 Total... 30 8 100 Skins Tanned will sell at Madras for ... ... 35 0 Profit on 100 Skins. ... 4 8 Profit on 10,000 Skins Annually at the Adambankum Tannery ... ... 450 0 Deduct Pay of Conacopoly... 84 0 Remaining profit ... ... 365 0 which sum constitutes the Annual remuneration for the personal labour, superintendance, and Stock of the Proprietors of the Tannery. The price of Raw sheep Skins has risen during the last four months to 4½ annas each, which leaves little profit to the Tanner. Raw Goat Skins formerly sold at 7 annas, now at 9 annas. The profits from Tanning are so slightly remunerative that *it is better to sell the Skins for exportation in a raw state.*

BODY GUARD PITS.

I. The Hides an steeped in lime Pit for ten days·
II. The Hair is removed.
III. Left to soak one day in clear water.
IV. Scrape the inside of the skin.
V. Leave it three days in clear water.
VI. Put it in Bark Pit one day.
VII. Transfer to another Pit with Bark and Bran, keep it there for five days.
VIII. Take it out of the Pit and put it in the shade to let the water run off.
IX. Put it into another Pit with Bark and Bran for thirty days.

I use Bran because it helps to clean the leather.

I use about one measure of lime to each hide.

I have tried a little gallnut on the leather of this saddle as an experiment to keep a good colour.

The Barks I use are "avarum" and "Vellum."

The flowers and Berries of the Divey Tree are better still, when procurable.

The kinds of Leather used in making up our Saddlery are as follows :—

Pilch and Pannels,	Sheep Skin.
Flaps. Sheep leathers. and wolf.	Buffaloe Hide.
Wallets. Baggage Bags. Bridles. Cruppers. Breastplates. Surcingles. Carbine sockets and all straps.	Bullock Hide.

Tree.—Trincomallee Wood.
Girthing.—Cotton.

CAPT. E. W. RAIKES.

25th February, 1857.

HOONSOOR TANNERY.

Tanning.

1st. To prepare Hides for tanning, the first operation, if they are dry, is to immerse them in water, a running stream if possible, till they are quite supple, and in order to cleanse them from all impurities removable by water, at intervals during the washing the Hides ought to be well broken over a wooden Tanner's Beam with a half round fleshing knife.

2nd. Neilgherry Buffalo Hides take from 2 to 3 days in washing. Cochin Hides the same time, or a little less. Country Buffalo, and all Bullock Hides from one to two : all Hides must be quite saturated and perfectly supple before they are removed from the water.

3rd. If the Hides are raw, that is fresh and supple from the carcase, it is necessary to wash them well in water, a running stream if possible, then to have a layer of 2½ lbs. of slaked Chunam laid in the flesh side of each Hide, which is then to be folded up with the flesh side innermost, and allowed to remain in that state for about 8 hours, when it is to be opened and put into the lime pits.

4th. The second operation is to immerse the Hides in lime pits, in which they remain for from 10 to 15 days during which they must be handled daily. The lime pits are prepared by mixing with water 20 baskets of lime for 100 Cochin Buffalo Hides, 15 baskets of lime for 100 Bullock Hides, and 30 baskets of lime for 100 Neilgherry Buffalo Hides, each basket containing 24 lbs.

5th. After the Buffalo and Bullock Hides have been in these pits for about 8 days, they are fleshed and cleaned with a currier's knife, in 4 days more the hair begins to come off, the removal of which and of any flesh that may remain occupies about 3 days more.

6th. The Hides are then taken from the lime pits and well washed in water, and then immersed in a solution of Bran for 24 hours.

7th. The third operation is to put the Hides in to Tan pits filled with water, the Hides are to be put in one by one in regular layers one over the other, and as smoothly as may be practicable : as the Hides are put into the tan pits small quantities of pounded bark are thrown in thinly over each layer of Hides, viz.

For Pits holding 30 Bullock Hides

1st day 6 Baskets or 108 lbs.	45th day 6 Baskets or 108 lbs.
5th do 6 do or 108 lbs.	75th do. 6 do. or 108 lbs.
20th do 6 do or 108 lbs.	90th do. 6 do. or 108 lbs.

Making in all 36 baskets of bark to be thrown in on 6 different occasions for Bullock Hides, which will be tanned in from 12 to 16 weeks.

For Pits holding 30 Cochin and Country Buffalo Hides.

1st day 8 Baskets or 144 lbs of Bark.	65th day 8. Baskets or 144 lbs. of Bark.
5th do 8. do. or 144 lbs. do.	85th day 8 do or 144 lbs do.
15th do 8. do. or 144 lbs do.	105th do. 8 do or 144 lbs do.
28th do 3. do. or 144 lbs. do.	120th do. 8 do or 144 lbe do.
45th do 8. do. or 144 lbs. do.	

Making in all 72 baskets of bark to be thrown in on 9 different occasions : these Hides will be tanned in about 4½ months.

8th. For pits holding 25 Neilgherry Buffalo Hides, 16 baskets of more bark is thrown in on the 140 and 160 days, making in all 88 baskets of bark to be thrown in on different occasions : these Hides will be tanned in about 5½ months.

9th. When the Hides are properly tanned they are to be taken out of the pits, and hung up to dry in the shade, but before they are quite dry they ought to be slacked down on a smooth floor or board to take out all creases or bags : they should then be doubled up with the grain side turned in, and again hung up in the shade to dry thoroughly.

10th. The tan pits should be made with sloping ledges on each side in order to drain the Hides and bark which should be taken out of the pits once in two days, or once every day if practicable, and

placed, the Hides on one side, the bark on the other, so that the water from both may drain back into the pits : the Hides, after they are sufficiently drained are again to be put into the pits, one at a time, and as each Hide is laid smoothly and sunk in the pit a double handfull of the bark should be sprinkled over it, leaving say a basket full of the bark to be sprinkled on the top layer of the Hide. A basket such as is herein alluded to will hold about 18 lbs. of bark in a dry state. The bark in use at Hoonsoor it that of the "Cassia Auriculata," and is considered the best of those found in India for tanning leather, it is ground in a mill similar to a large Coffee mill previously to its being put into the pits.

Dressing.

The hides are soaked in water until the water has penetrated to the centre of the Hide, they are then shaved on the flesh side with a currier's knife to the required thickness.

2nd. The Hides are then put into a soak tub with clear water for an hour or two, they are then put through the process of scouring by first sleeking them hard on the flesh side with an Iron sleeker, and well brushed two or three times with a good hard brush, then turn to the grain side and well stoned out with a smooth stone, and brushed over two or three times.

3rd. The Hides are then hung up till they are about half dry, after which one Hide, or half a hide, is laid upon a table and well stoned out on the grain side, then firmly sleeked out for the purpose of making a smooth surface, then an application of Fish Oil is thinly laid on with a brush, the flesh side is then turned up and the hide again firmly set out with the sleeker when an application of dubbing (composed of Fish Oil and Tallow) is put on with a brush according to the strength of the Hide, the Hide is then hung up to dry.

4th. When the Hide is thoroughly dry it is taken down and the refuse of grease is sleeked off, it is then blacked upon the grain or flesh side as it may be required with copperas or Iron Liquor, and immediately rubbed over with oil to prevent the Iron Liquor from burning the leather, or causing it to crack, they are then well stoned out with a smooth stone, well rubbed over with Tallow, on the blacked side, and then hung up to dry, when dry they are again rubbed over with a smooth round stone, then well brushed and the dressing is finished.

For dyeing 20 Sheep Skins.

The Sheep skins if dry should be immersed in water for 48 hours and then put in lime for the same time, they are afterwards put in clean water for 24 hours, after which they are put for 483 hours in raggey flour, boiled in water, 5 Seers of the former to 6 gallons of the latter.

The dye is after this applied composed of

Lack	lbs. 9.
Alum	oz. 2.
Saffron	lbs. 3,
Ullick leaves	lbs. ½.
Soda	oz. 4.

These are all well pounded and boiled for 10 hours in 2 gallons of water. When cool strain and rub into the skins with hand.

To fix the dye the skins are then put into an infusion of sumack and gallnut, 15 lbs. of the former to 30 lbs. of the latter, in this infusion they are kept for 48 hours, and should be frequently handled during that time.

Salt is afterwards rubbed into the flesh side, the skin folded over and worked with the hand, after 2 or 3 hours the salt should be washed off in cleau water.

A polish is then given to the grain by rubbing it with a smooth stone and gingely oil.

WHITE SHEEP SKINS.

After the hair has been removed in the usual way the skins are laid in bran for 8 days, after which they are well washed and put in alum,* in which they remain for 8 days, or until thoroughly tanned, when they are again well washed, and worked in a composition† of eggs and arrowroot for about 84 hours.

* Alum lbs. 1
White salt oz. 4.

† Egg dozens 1½,
Arrowroot ozs. 4.

After another washing they are dried and staked, and then finished off with a hot iron.

GUNTOOR DISTRICT,
Collector's Office,
Bauketta, 7th April 1857.

From H. NEWILL, Esq., Acting Collector of Guntoor.

To EDWARD BALFOUR, Esq., Secretary to the Madras Exhibition.

Sir,—I have the honor to furnish you with the information called for in your communication of the 10th February last relative to the process of preparing leather.

2. The process of tanning is given for 10 sheep hides, six seers of rice flour are boiled into a conjee, with which a seer and a half of salt is mixed, and in this solution the hides, after being cleaned in good water, are kept soaking for 5 days. This process is adopted in order to facilitate the separation of the hair from the skins, on the 5th day the hair is scraped off with a knife ; and after again being washed in clean water, they are exposed to the sun for about 5 or 6 days. They are again immersed in water and kept in that state for 3 days. The hides are again soaked in the rice conjee without the admixture of salt for 2 days, and are then again washed. Two seers of raw lac are pounded and the juce extracted therefrom. In this solution the ash of tuzza grain, turmeric powder, and the powder of alliaku (a dye leaf) seven Toolas each, are mixed. This solution is boiled so that one half of the liquid may

go off in evaparation. This prepared liquid is rubbed on the skins to which it gives a purple colour. On the same day they are soaked in water mixed with a basket full of well pounded Tungadoo bark, and allowed to remain in it for 3 days. This process of soaking is repeated twice.

Skins are prepared in this manner at Guntoor in large quantities according to the demand for them.

I have the honor to be, &c.

(Signed) H. NEWILL,

Collector of Guntoor.

(A True Copy.)

E. BALFOUR,

Secretary Madras Exhibition.

To Major G. W. Y. SIMPSON,

Reporter in Class XVI.

No. 878.

CHINGLEPUT DISTRICT,

Collector's Cutcherry,

Sydapet, 7th April 1857.

To Surgeon E. BALFOUR, Secretary Madras Exhibition.

Sir,—With reference to your letter of the 10th Ultimo with enclosure to Muniputtah, Lubbay, Chengleput, I have the honor to inform you that though every effort has been made to procure the attendance of that individual with a view to his giving the information required by the committee on Class XVI, they have all failed, from, it is believed, an impression he seems to have that he is acquainted with a secret in the art of Tanning or dyeing leather, which he is not willing to divulge, as, frequently as he has been sent for he has promised to attend, but has every time failed.

In the absence of the information sought to be obtained from him individually, I beg to enclose a Memorandum on the subject drawn up by C. Runga Charloo, Tahsildar of Sydapet, which may prove interesting to the committee, and give them a full knowledge of the process of tanning as followed in this District, and the approximate cost and profits.

I have &c. &c.

(Signed) C. SHUBRICK,

Collector.

(A true copy.)

E. BALFOUR,

Secretary Madras Exhibition.

To Major G. W. Y. SIMPSON,

Reporter, Class XVI.

திருசுவாரி தோல்கள் செய்யும் ஜாப்தா.

மகா-ள-ள-ஸ்ரீ. ஐயா, மதிராசு சர்ஜன் இ. பெல்போர்ட் செக்கிரட்டேரி அவர்களுக்கு பாலக்காட்டுச் சேரியில் தோல் ஷாப்பு வீராசாமி முதலி மிகவும் வணக்கத்துடன் வந்தனஞ்செய்து எழுதிக் கொண்டது என்னவென்றால்,

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கடுக்காய்த் தோல் செய்யும் விவரம்.

முதல் ஆட்டுத்தோலைக் கொண்டுவந்து-ங-அடி அகலம்-ரு-அடி நீளமுள்ள சுண்ணாம்பு காறையாடிய கல்த்தொட்டியில் கிளிஞ்சில் நீறு சுண்ணாம்பு-ஙசு-படி போட்டு அதற்குத் தகுந்தபடி தண்ணீர்விட்டுக் கரைத்து வெள்ளாட்டுத் தோல் அல்லது செம்மரித்தோல்-ள-கொண்டுவந்து முதல் அழுக்கில்லாமல் தண்ணீரில் கழுவிக்கொண்டு கரைத்துவைத்த சுண்ணாம்பில் தோய்த்துத் தோய்த்து மேற்கண்ட தொட்டியில் ஒன்றின்பேரில் ஒன்றாய் விரித்து - ஷி சுண்ணாம்பு கரைத்த தண்ணீரில் அடங்கியிருக்க விட்டு வைக்கிறது. மறுநாள் தோலைத் தொட்டியின்பேரில் ஷி தோல் ஒருமிக்க எடுத்துவைத்து முன் விட்டிருந்த சுண்ணாம்பைத்தானே மறுபடி கலக்கி, கலக்கின தண்ணீரில் மறுபடி அந்தத் தோலைத் தோய்த்துத்தோய்த்து அடுக்கி வைக்கிறது. ங-நாள் அந்தத் தோலைக்கரையில் எடுத்துவைத்துப் பனைமரத்திலாவது வீட்டு மரத்திலாவது செய்த சாபு மரத்தின்பேரில் போட்டு இரும்பும் எஃகுங் கலந்த இரண்டு பக்கம் பிடியுள்ள சாபு கத்தியினால் முடியைத் தள்ளுகிறது. ள-தோலும் முடியைத் தள்ளி வைத்து, உடனே மேற்கண்ட தொட்டியில்-உ-வது முன்போட்ட சுண்ணாம்பு தொகைக்குப் பாதி சுண்ணாம்புபோட்டு அந்தத் தொட்டியில் இருக்கிற தண்ணீரில்தானே கலக்கி மறுபடி அந்தத் தோலைத் தோய்த்து அந்தத் தண்ணீரில் அடங்கியிருக்கும்படி அழுந்தி வைக்கிறது. மறுநாள் அந்தத் தோலைத் தொட்டியின் பேரில் மொத்தமாய் எடுத்துவைத்து, அந்தத் தோலிருந்த சுண்ணாம்பு தண்ணீரைக் கலக்கி ஷிதோலை அந்தத் தண்ணீரில் தானே தோய்த்து வைக்கிறது. மறுநாள் அந்திநேரத்துக்கு ஷி தோலை வெளியிலெடுத்துவைத்து மேற்கண்ட விசாலமுள்ள வேறொரு கல்த்தொட்டியில் ஷி தோல்-ள-ம் - வாரிப்போட்டுச் சுத்த சலத்தைத் தொட்டியில் நிறைய இறைத்து விட்டு அரைநாழிகை நேரம் மிதித்து அலசி மேலே எடுத்து வைத்துக்கொண்டு அதுபோலொத்த வேறொரு தொட்டியில் நிறையத் தண்ணீரை விட்டுத் தோலை வாரிப்போட்டு வைக்கிறது. மறுநாள் தண்ணீர்த்தொட்டியில் இருக்கிற தோலை சாபுமரத்தின் பேரில் ஒவ்வொன்று

கப்போட்டுச் சவ்வுபுறமாக மேற்கண்ட சாபு கத்தியினால் சீவுகிறது. அப்படி சீவப்பட்ட ஆள் ஆவிரம்பட்டையில் ஊறிக் காய்ந்த தோல் அரையில் கட்டிககொண்டு சாபுமரத்தின்பேரில் எதிராகச் சாய்ந்துகொண்டு சீவப்பட்ட தோல் நகர்ந்துபோகாமல் வயற்றினால் அழுத்திக்கொண்டுசீவுகிறது. இவ்விதமாக-௱-தோலையுஞ்சீவித் தண்ணீரில் போட்டு வைக்கிறது. மறுபடி ஒரு தொட்டியில் தண்ணீரை நிரப்பி அரைநாழிகை மிதிக்கிறது. மிதித்து அந்தத் தோலைத் தொட்டியின்பேரில் எடுத்துப்போட்டுத் தண்ணீரை வடியவைத்து அந்தத்தோலைச் சாபுமரத்தின் பேரில்மோதிப் புறம்மேல்வைத்து ஒன்றின்பேரில் ஒன்றாய் அடுக்கிச் சீவுகிறது. சீவி-௯-அடி உயரம்-௨௰-அடி அகலமுள்ள மரத்தொட்டியில் தண்ணீரை நிரப்பி இரண்டாள் கூடி இரண்டுநாழிகைவரையில் மிதிக்கிறது. மிதித்துச் சாபுமரத்தின்பேரில் மறுபடியும் ஒவ்வொன்றாகப்போட்டுச் சவ்வுபுறமாகச் சீவுகிறது. சீவி எதிரில் ஒரு தொட்டியில் தண்ணீரை நிரப்பி அதில் போடுகிறது. அப்படி-௱-தோலுஞ் சீவிப் போட்டு முன் தோலிருந்த அழுக்குத் தண்ணீரைத் திறந்துவிட்டு மறுபடியுஞ் சுத்தசலமாக நிரப்பி-௫-௰-௫௰-தோலாகப்போட்டு -௨-ஆள் கூடித் தொட்டியில் இறங்கித் தண்ணீர் இல்லாமல்-சுண்ணாம்பு காரங் கக்கும்படி தோலை ஒரு சாம பரியந்தம் மிதிக்கிறது. மிதித்த தோலில் மறுபடி-௨-குடம் தண்ணீர் விட்டு-௨-ஆள்தொட்டியிலிறங்கி-௨-நாழிகைவரையில் மிதிக்கிறது. மிதித்த தோலை ஒரு தொட்டியில் ஒருமிக்கப் போட்டுக்கொண்டு -௪-நாழிகை பரியந்தம்-௨-ஆள் கூடி மிதித்து, மிதித்த தோலைத் தொட்டியின்பேரில் எடுத்துப்போட்டுத் தண்ணீர் வடிந்தபின்பு அந்தத் தோலைச் சுத்தமான தொட்டியில் போட்டுக்கொண்டு தண்ணீரை விட்டுமிதித்து அலசி எடுத்துவந்து, பீப்பாத்தொட்டியில்-௰-படி ஆவிரம் பட்டை போட்டு இரண்டுகுடந் தண்ணீர்விட்டு-௰-தினம் ஊறவைத்த தண்ணீரில் மேற்கண்ட தோலைக் கொண்டுவந்து சுத்தமான இடத்தில் வைத்துக்கொண்டு அந்தப்பட்டையை ஒரு சின்னத் தொட்டியில்வாரி வைத்துக்கொண்டு அந்தத் தோலைப் பட்டைத் தண்ணீரில் ஒவ்வொரு தோலாகத் தோய்த்துத் தோய்த்துப்போட்டுத் தோலுக்குத் தோல் ஒவ்வொரு கை பட்டைப்போட்டு அந்தப் பட்டைத் தொட்டியில் ஒன்றின்பேரில் ஒன்றாய்ப்போட்டுத் தோல் சுருக்கம் தண்ணீர்க்குள் அடங்கி இருக்கும்படி விழாமல் ஊறவைக்கிறது. மறுநாள் ஒரு பலகையைத் தொட்டியின்பேரில் வைத்து, ஷெ தண்ணீரும் பட்டையுஞ் சேதப்படாமல் அந்தப் பலகையின் பேரில் -௱-தோலும் எடுத்துப்போட்டுக்கொண்டு பின்பு அந்தத் தோலை மேனிபுறம் மேல்வைத்து ஒவ்வொரு தோலாகப்பட்டையைத் தெளித்துத் தெளித்துச் சுருங்காமல் தண்ணீர்க்குள்ளடங்கி இருக்கும்படி தோலை ஒன்றின்பேரில் ஒன்றாய்ப்பாத்திவைக்கிறது. மறுநாள் அந்தப்பட்டையுந் தண்ணீரும் நீக்கிப் போட்டுச் சுத்தமான மரத்தொட்டியில்-௨௰-குடந் தண்ணீர்விட்டு ஆவிரம்பட்டை பட்டணம் படி-௫௰-படி போட்டு அந்தப்பட்டை ஒரு நாழிகைபரியந்தம் ஊறினபின் கைதொட்டியில் அந்தப்பட்டையை வாரிவைத்துக்கொண்டு முன் பட்டையிலிருந்த தோலை உதறி எடுத்துப் பட்டைத்தொட்டியில் ஒவ்வொருதோலாகப்பட்டையைத் தெளித்துத் தெளித்துச் சுருக்கமில்லாமல் தண்ணீர்க்குள்ளடங்கியிருக்கும்படி பாத்திவைக்கிறது. மறுநாள் அந்தத்தோலைத் தொட்டியின்பேரில் பலகையைவைத்து அந்தப் பலகையின்பேரில் தோலையெடுத்து ஒருமிக்கவைத்துக் கொண்டு தொட்டியிலுள்ள பட்டையைச் சின்னத் தொட்டியில் எடுத்துப்போட்டுக்கொண்டு அந்தப் பட்டைத் தண்ணீரில் தோலைப்போட்டு தோலுக்குத் தோல் பட்டை தெளித்துத்தெளித்து ஒன்றின்பேரில் ஒன்றாய்ச் சுருக்கமில்லாமல் அடுக்கித் தண்ணீர்க்குள் தோலடங்கி இருக்கும்படி அடுக்கிவைக்கிறது. இப்படி-௫-நாள் பரியந்தங் காலமே காலமே திருப்பிக்கொண்டுவருகிறது. ௫-நாள் தோலைத் தொட்டியின்பேரில் எடுத்துவைத்துக்கொண்டு முன்னுள்ள பட்டையுந் தண்ணீரும் ஒழித்துவிட்டு ௨-வது- ௨௰-குடந்தண்ணீர்விட்டு-௪௰-படி ஆவிரம் பட்டைபோட்டு-௧-நாழிகை ஊறினபின் ஒரு சின்னத் தொட்டியில் பட்டையை எடுத்துவைத்துக்கொண்டு அந்தப் பட்டைத்தண்ணீரில் தோலைப்பாத்தி பட்டை தெளித்துத் தெளித்து ஒன்றின்பேரில் ஒன்றாய்ப்பட்டைத்தண்ணீரில் அடங்கியிருக்கத் தோலைத் தொட்டியில் அடுக்கிப் பிரதிதினம் அந்தத் தோலைக் காலமே காலமே திருப்பிக் கொண்டு வருகிறது. இப்படி-௫-நாள்-௨-ம்-பட்டையில் ஊறவைத்து-௫-நாள் அந்தத் தோலையெடுத்துச் சுண்ணாம்பு படாத சாபுமரத்தின்பேரில் போட்டுச் சவ்வுபுறமாகச் சீவியெடுத்து அடுக்கிவைத்துக்கொண்டு கடுக்காய் இந்த ஊர் தண்ணீருக்குப் பட்டணம்-௰௫-படி கடுக்காய் கல்லில்வைத்து நருக்கிக் கொட்டைமுதலாகச் சேதமில்லாமல் பட்டையில் ஊறின மாட்டுத்தோலின்பேரில் போட்டு இடித்து வைத்துக்கொண்டு ஒரு செப்புஅண்டாவில் ௭௫-படி தண்ணீர் விட்டு எரித்துத் தண்ணீர்கொதித்த பிற்பாடு முன்கண்ட அளவுள்ள மரத்தொட்டியில் நருக்கிவைத்த கடுக்காய்த் தூளைப்போட்டு அண்டாவில் கொதித்த தண்ணீரை நருக்கிப்போட்டிருக்கிற கடுக்காயில் ஊற்றி அந்தத் தண்ணீரில் கடுக்காய் வெந்தபின்பு பட்டையிலிருந்து சீவிவைத்த தோலை எடுத்துக் கடுக்காய் போட்டிருக்கிற தொட்டியின்பேரில் பலகைபோட்டு அந்தத்தோல் ஒருமிக்க எடுத்துவைத்துக்கொண்டு கடுக்காய்த்தூள்போட்டு இருக்கிற தண்ணீரில் சூடாயிருக்கும்போதே தோல்களை ஒவ்வொன்றாகத் தோய்த்துத் தோய்த்து ஒரு பக்கமாய் வைத்துக்கொண்டு அந்தத் தொட்டியிலிருக்கிற கடுக்காயைச்சின்னத்தொட்டியில்எடுத்துப்போட்டுக்கொண்டு அந்தத்தொட்டியில்தானே கடுக்காய்த்தண்ணீரில்தானே தோல்முழுவதும் ஒன்றின்பேரில் ஒன்றாய்ப்போட்டு மாத்தி கடுக்காய் முழுவதும் அந்தத்தோலின்பேரில் சேதப்படாமல் போட்டு ஊறவைத்து மறுநாள் அந்தத் தொட்டியிலிருக்கிற தோலைத் திருப்பிக் கொடுக்கிறது. மறுநாள் கடுக்காய்த்தொட்டியிலிருக்கிற தோலையெடுத்து ஒவ்வொன்றாக முறுக்கிப் பிழி

ந்து தண்ணீர்போகப் பிழிந்து சாபுமரத்தின்பேரில் அடுக்கிச் சாபுகத்தியினுல் சீவியெடுத்து வைத்துக்கொண்டு அந்தத்தோல்-௱-க்கும் - ௩-படி நல்ல எண்ணெய் கொண்டுவந்து முன்சீவின தோலை-௩-அடி உயரமுள்ள விசிப்பலகையின்பேரில் ஒன்றின்பேரில் ஒன்ருய்ச் சுருக்கமில்லாமல் அடுக்கிக்கொண்டு தோல்மோதிபுறமும் சவ்வுபுறமும் தெளித்துத் தெளித்துக் கையால் தேய்த்துத் தேய்த்து எடுத்துச் சுருக்குமில்லாமல் தடவிக்கொடுத்து நெடும்பறையில் கொடிகட்டி அந்தத்தோலை மடித்துப்போட்டுக் காற்றுலரலாக உலர்ந்தபிற்பாடு எடுத்து மும்மூன்று தோலாக எடுத்துச் சுருட்டி ஒரு கல்லின்பேரில் அடித்துத் தோல் நெகிழ்ந்துவந்தபிற்பாடு திமிர்வாங்கியென்கிற ஆயுதத்தினுல் திமிர்வாங்கித் தோலையிழுத்துப் பின்பு சவ்வுபுறமாகச் சீமைச்சுண்ணும்புதேய்த்துச் சக்கரமென்கிறசுற்றிலும் கூருள்ள ஆயுதத்தினுலே சவ்வுபோகும்படி சீவியெடுத்து வைத்துக்கொள்ளுகிறது. இந்தக் கடுக்காய்த்தோல் - உ௰-நாளையில் தீரும்.

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முதல் - சுண்ணும்பில் விடுகிறது தோல் வெந்து மயிர்வரும்படி.

உ - வது. இளங்காரத்தில் விடுகிறது சவ்வுவேகிறதற்காக.

௩ - வது. மிதித்துச் சீவுகிறது சுண்ணும்புகாரம் கக்கும்படி.

௪ - வது. பட்டையில் விடுகிறது தோல் மிருது உண்டாக.

௫ - வது. கடுக்காயில் விடுகிறது சொகுசான நிறங்கொடுக்க.

௬ - வது. நல்லெண்ணெய் போடுகிறது சயன் வரும்படி.

எ - வது. சுருட்டி அடிக்கிறது தோல் நீண்டு கொடுக்க.

அ - வது. திமிர்வாங்குகிறது தோல் அகன்று விசாலங்கொடுக்க.

௯ - வது. சீமைசுண்ணும்பு போட்டு சக்கரத்தினுல் அடிக்கிறது தோல் சவ்வுபுறம் பட்டுப்போலாக்கும்படி.

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இதற்குப் பட்டுபடி சிலவு.

வெள்ளாட்டுத்தோல் ௱-இ-கி-ரூ உஎ
சுண்ணும்புபடி - - -௫௪-இ-கி ரூ க௰பதி
பட்டைபடி தடவை உ௫-ப-இ-கி-ரூ ௩௲
கடுக்காய்துலான் க-இ-படி-௰௫-இ-கி-ரூ வநூ
நல்லெண்ணெய்படி - ௩-இ-கிரயம்-ரூ கவவறு
சவ்வின் புறமாகத் தேய்க்க சீமை சுண்ணும்பு கிரயம்-ரூ. வ.
இந்த ௱-தோலுக்கும் பத்து ரூபா-சம்பளமுள்ள ஆளுக்கு பூராவாக ௰-நாளைய வேலைக்கும் சம்பளம் - - - - - - - - ரூ ௩வபதி-து-க
ஆ தோல்கிரயங்கூட்டி - - ரூ ௩எ௰-நூ-து-க
இதற்குத்தோல் ௱-இ-வண்டி செலவு ரூ உ
இதற்கு விறகு செலவு - - - - - ரூ பதி
இந்தத்தோல்அவுசுகளில் ச௫ - ஆக விற்கும் ௱ தோல்.

படிக்காரத்தோல்விவரம்.

முதலாவது தோல் செம்மரித்தோல் கொண்டு வந்து சுண்ணும்பில் மேற்சொல்லியபடி ஊறவைத்து முடிதள்ளி மறுபடி சுண்ணும்பில் விட்டுச் சவ்வு புறஞ் சீவி, சீவின தோலைத் தண்ணீர்த் தொட்டியில்போட்டு ஒருநாழிகை பரியந்தம் மிதிக்கிறது. மிதித்து மேனி புறஞ்சீவித் தண்ணீர்த் தொட்டியில் போட்டுக் கழுவி வெளியிலெடுத்துத் தண்ணீரை வடியவைத்துத் தோல் ௱-க்கு-௫-வீசை படிக்காரம் இடித்துக்கொண்டு உ௰-படி உப்பும் போட்டுக் கலந்து நல்ல தண்ணீர் ௰௫-படி தண்ணீர்விட்டு ஒரு அண்டாவில் போட்டுக் காய்ச்சி உப்பும் படிக்காரமுங் கரைந்து கொதித்து வருகிறவரையில் துளாவிக்கொடுத்து ஒரு பீப்பாத் தொட்டியிலெடுத்து ஊற்றிக்கொண்டு ஒரு நாழிகை ஆறப்போட்டு முன் வெளியிலெடுத்து வைத்த தோலை அந்தப் படிக்காரத் தண்ணீரில் ஒவ்வொரு தோலாகத் தோய்த்துத் தோய்த்துத் தொட்டியின்பேரில் பலகைபோட்டு அதின்பேரில் தோல் முழுவதும் எடுத்துக்கொண்டு மறுபடியுந் தொட்டியிலுள்ள படிக்காரத் தண்ணீரில் ஒன்றின்பேரில் ஒன்ருய் அடுக்கி ஊறவைக்கிறது.

மறுநாள் அந்தத் தோலை வெளியிலெடுத்துச் சாபுமரத்தின் பேரில் சவ்வு புறம் மேலாக அடுக்கிச் சீவி அந்தத் தண்ணீரில்தானே மறுபடியும் பாதி விடுகிறது. மறுநாள் கரையேற்றி வெளியிலெடுத்து இரண்டுகால் புறமும் துவாரஞ்செய்து கயிறு கோத்து வெய்யிலில் கட்டிவிடுகிறது. நன்ருய்க் காய்ந்த பின்பு அந்தத் தோலை எடுத்து மேலே தண்ணீர் தெளித்து உ-நாழிகை தோலை வைத்துத் தோல் நமத்த பிற்பாடு அந்தத் தோலைக் காலில் மிதித்துக்கொண்டு இழுக்கிறது. இந்த ௱ - தோலும் இழுத்து ஒரு நாழிகை வெய்யிலிற் போட்டுத் திமிர்வாங்கி என்கிற ஆயுதத்தினுல் திமிர்வாங்கி மறுபடியும் வெய்யிலில் வைத்து ஒரு நாழிகை இருந்த பின்பு மறுபடியுந் திமிர்வாங்கி சக்கரமென்கிற ஆயுதத்தினுல் சவ்வுபுறம் பட்டுப்போல் சீவி எடுத்து வைக்கிறது.

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படிக்காரத்தோலுக்குப் பட்டுபடி.

செம்மரித்தோல் - - ௱-இ-கிர-நூ ௰௩௰
சுண்ணும்புபடி-தடவை உ-இ-படி-௫௪-இ-நூ க௰பதி
படிக்காரம் வீசை - ௫-இ-கிர-நூ கஅவறு
உப்பு படி - - - - உ-இ-கிர-நூ நூ-தி க௰
எரிக்க விறகு செலவு - - - - நூ பதி
இதற்கு ௰-நூ-சம்பளமுள்ள ஆளுக்கு ௬-நாளையவேலைக்குச்சம்பளம் நூ-உ.
ஆ கூடிய நூ-௰கநூது-க௰.
சென்னபட்டணம்போக வண்டிசெலவுநூ-உ
ஆ கூடிய நூ உ௰சநூது-க௰.
இந்தப்படிக்காரத்தோல் ௰-நாளையில் தீரும்.

நீலத்தோல் விவரம்.

கடுக்காய்த் தோலுக்கு எழுதிய விவரத்தின்படி மேற்படி தோல் பட்டைத் தொட்டியில் ஊறின பின்பு சடுக்காய்த்தண்ணீரில் தோய்க்கிறபதத்தில் எடுத்துச் சீவி நல்லதண்ணீரில் அந்தத் தோல்களைக்கழுவித் தோலை நீண்ட வாட்டில் சவ்வுபுறம் உள் வைத்து மடித்து நீலச்சாலடியில் காங்கு புடைவை தோய்க்கிறதற்கான நீலத்தில் தோய்த்துக்கொண்டுவருகிறது. கொண்டுவந்து காலபுறந் துவாரஞ்செய்து கயிறுகோத்து நிழலிற் கட்டி விடுகிறது. கட்டினபின் உ - நாழிகை உலரவிட்டுத் தோலை மேசைப்பலகையின் பேரில் போட்டுத் தாருப்பலகையென்கிற ஆயுதத்தினால் சவ்வுபுறம் சுருக்கமில்லாமல் தள்ளி நிழலில் கட்டுகிறது. மறுபடியும் ஒரு நாழிகை ஆறவிட்டு நல்லெண்ணெய் மேனிபுறந் தடவி சற்றுநேரம்ஆறவிட்டுத் துணியினால் மேனி புறந் துடைத்துவிட்டு எலுமிச்சம் பழதைப் பிழிந்து பீங்கான் கோப்பையில் வைத்துக்கொண்டு ௸ ரசத்தைத் தெளித்து வெண்மையான துணிகொண்டுநன்றாய்த் தேய்க்கிறது. பின்பு ௸ சயன் கல்லினால் தேய்த்து ௸ சயன் வரும்படி செய்து பாலக்கட்டையினால் வரிவிழும்படி கடைச்சல்வேலைசெய்திருக்கிற குண்டினால் கீற்று கட்டுகிறது.

நீலத்தோல் வேலை.

இதற்குப்பட்டுபடி ஈவு விவரம்.

வெள்ளாட்டுத்தோல் -	ா-இ-கி-நூ	உஎ.
சுண்ணாம்புபடி - -	ருச-இ-கி-நூ	கஉபீ.
பட்டைபடி - - -	கூ௰-இ-கி-நூ	௬ஜ.
நீலந்தோய்க்கத் தோல்	ா-இ-கி-நூ	௰உ௯.
தோல்ா-இ-எலுமிச்சம்	ா-இ-கி-நூ	வறு.
நல்லெண்ணெய் பட்டுபடி	செல-நூ	க.

இதற்குச் சயன் வேலைக்கு ஆள் அதிகஞ் செல்லுகிறபடியால் ௸ வேலைக்கு உ௰-ஆளும் மற்ற வேலைக்கு ரு - ஆளும் ஆக உரு - ஆளுக்குச் சம்பளங் கூடிய - நூ அவபீ. து-க.

ஆக கூடிய - நூ ருசஉ. து-க.

இது. உஉ-நாளில்செய்துமுடிக்கலாம்.

சிவப்புத்தோல் விவரம்.

தோலைக்கொண்டுவந்து சுண்ணாம்புத் தொட்டியில் விட்டு முடிதள்ளி மறுபடி சுண்ணாம்புகாரத்தில் விட்டு மறுநாள் தோலை அந்தக் காரத் தொட்டியில் ஒருதடவை திருப்பிக்கொடுத்து மறுநாள் வெளியிலெடுத்து விசாலமுள்ள தொட்டியில் தண்ணீரை விட்டு வாரிப்போட்டு இரண்டுநாழிகைமிதித்துச் சாபுமரத்தின்பேரில் போட்டுச் சவ்வுபுறமாகச் சீவுகிறது. சீவினபின்பு புதுத்தண்ணீர் விட்டு மிதித்து எடுத்து நல்ல அரிசி-௰ படி கொண்டுவந்து பானையில் ஊறப்போட்டு இடித்து ஜ-படி உப்புபோட்டு கூழாக ஆக்கிக்கொள்ளுகிறது. அந்தக் கூழைப் பீப்பாத்தொட்டியில் ஊற்றிக்கொண்டு ஆறப்போட்டு அந்தக்கூழில் ஒவ்வொரு தோலாகத் தோய்த்து அந்தக்கூழில் தானே தோலை ஒன்றின் பேரில் ஒன்றாய் மாத்தி ஊறவைக்கிறது. அப்படி விட்டது ஆ எட்டுநாள்பரியந்தம் திருப்பிக்கொண்டே வருகிறது. பின்பு தோலையெடுத்துக் கழுவிக் காயப்போட்டு விடுகிறது. நன்றாய்க் காய்ந்தபிற்பாடு ஒரு பீப்பாயில் நல்ல தண்ணீர் நிரப்பிக காய்ந்த தோலைத் தண்ணீரில் அழுத்துகிறது. அழுத்தி ஊறின பின் மிதித்துக் கழுவி எடுத்துக்கொண்டு மறுபடி - ம - படி அரிசிபோட்டு உப்பு சேர்க்காமல் கூழாக்கிக்கொள்ளுகிறது. கூழை ஒரு மரத்தொட்டியைச் சுத்தமாக்கி அதில்விட்டு நன்றாய் ஆறினபின் முன்கழுவி வைத்திருந்த தோலை ஒவ்வொன்றாகத் தோய்த்து ஒன்றின் பேரில் ஒன்றாக மாத்தி அந்தக் கூழில் ஊறவைக்கிறது. ஊறப்பட்ட தோலை அ-நாள்பரியந்தம் தினத்துக்கு ஒரு தடவை திருப்பிக்கொண்டே வருகிறது. எட்டுநாளானபின் அந்தத் தோலை எடுத்துக் கழுவி வைத்துக்கொள்ளுகிறது.

இப்படிக்கு-வீராசாமி முதலி.

சிவப்புத்தோல் விவரம்.

கொம்பு அரக்கு -	வீசை -	உ௯.
கடப்பைகாரம் -	பலம் -	ரு.
காசா இலை - - - -	பலம் -	ரு.

இவைகளை இடித்துத் தூளாக்கிக்கொண்டு ௬-படி நல்ல தண்ணீர் விட்டுப் புதுப்பாண்டத்தில் வைத்துக் காய்ச்சும்போது துளாவிக்கொண்டே வருகிறது. இந்த ௬ - படி தண்ணீரும் க௯-படியாகக்காய்ச்சிக்கொண்டு சாயங்கொடுத்துவரும்போது இறக்கிக்கொள்ளுகிறது. இறக்கி வடிகட்டிக்கொண்டு மறுபடியும் ஜ-படி தண்ணீர் விட்டு அந்த அரக்கைக் காய்ச்சிக்கொள்ளுகிறது. இந்தச் சாயத்தைச் சாலில்வைத்துக்கொண்டு முன் கழுவிவைத்திருந்த தோல்களை நிகளவாட்டாகச் சவ்வுபுறம் உள் வைத்து மடித்து ௸ சாயத்தைக் கொஞ்சங் கொஞ்சமாய் விட்டுச் சாயமடிக்கிறது. சாயமடித்தபின்பு ஒரு தொட்டியில் சு-குடம் தண்ணீர்விட்டு உ௰ -படி ஆவிரம் பட்டை போட்டுச் சாயமடித்த தோல் முழுதும் பட்டைபோட்டிருக்கிற தொட்டியில் ௸ தோலைத் தோய்த்துத் தோய்த்துப் பட்டையைத் தெளித்து ௸ தொட்டியில் ஊறவைக்கிறது. மறுநாள் அந்தத் தொட்டியிலிருக்கிற தோலைத் திருப்புகிறது. மறுநாள் அந்தத் தோலையெடுத்துத் தண்ணீரில் கழுவிப்போட்டு இரண்டு காலிலுங் கயிறு கோத்துக் கட்டி உ - நாழிகை ஆறினபின் மேசையின்பேரில் போட்டுத் தாருபலகையென்கிற ஆயுதத்தினால் சவ்வு புறமாகத் தள்ளிச் சுருக்கமில்லாமல் செய்து மறுபடியும் நிழலில் கட்டி க - நாழிகை ஆறவைத்து மேனிபுறம் நல்லெண்ணெய் தடவித்தேய்த்துக் கட்டிவிட்டு ஈரமில்லாமல் ஆறவிட்டு சயன் கல்லினால் சயன் வரும்படி தேய்த்து எலுமிச்சம் பழம் ா - கோழிமுட்டை ா - கொண்டுவந்து ௸ வெள்ளை அம்பிலி எடுத்து முதல்

எலுமிச்சம்பழ ரசத்தை அழுக்கில்லாத மெல்லிய துணியினால் நனைத்துத் தேய்க்கிறது. ஆறவிட்டுக் கோழிமுட்டை அம்பிலியும் அப்படியே தேய்க்கிறது. தேய்த்துச் சயன்கல்லினால் சயன் வரும்படி செய்து குண்டு கட்டையினால் வரிகட்டி எடுத்துவைக்கிறது.

வெள்ளாட்டுத்தோல் ௱ - இ கி-நூ. உஎ

சுண்ணும்பு படி - - ருச-இ கி-நூ. கஉபலீ

பட்டை படி - - - - உரு-இ கி-நூ. ஜபலீ- துக.

தடவை - - - - - - உ-இ அரிசிபடி உய-இ நூ. உ.

உப்புபடி - - - - - ஜ-இ கி-நூ. பலீ து-க.

அரக்குவீசை - - - உ௦-இ கி-நூ. கஜவறு

கடப்பைகாரம் காசாயிலே நூ. வ

எலுமிச்சம்பழம் - ௱ - இ கி-நூ. வவறு

முட்டை - - - - - - ௱ - இ கி-நூ. ௦

நல்லெண்ணெய் வீசை க-இ கி-நூ. க

மேற்படி ஆளுக்கு - உஎ- இ நாள்வேலைக்கு சம்பளம் - - - - - - - நூ. கூவறு து-உ

ஆக கூடிய - - - - - - - நூ. சசவறுபலீ து-க.

இது ஙய-நாளில் செய்துமுடிக்கலாம்.

ஊதாதோலினுடையவிபரம்.

மேற்கண்ட சிவப்புத்தோல் பட்டையில் ஊறின சமயத்தில் நீலந்தோய்த்தால் ஊதாவாகின்றது. இந்தத் தோலுக்கும் சயன்செய்து குண்டுகட்டுகிறது உண்டு. இதற்குச் சிவப்புத் தோலுக்கு உண்டாகிய பட்டுபடிச் சிலவுக்கு மேல் நீலந் தோய்க்கிறதுக்கு ௱ - க்கு யக௦-ரூபாய் அதிகம் செலவு.

தோலுக்கு முடியோடு சவ்வுபுறம் படிக்காரம் போடுகிற விவரம்.

மான் தோலைத் தண்ணீரில் ஊறவைத்து மறுநாள் சாபுமரத்தின்பேரில் போட்டுச் சவ்வுபுறஞ் சீவி மிதித்துக்கழுவி தோல் - ௱ - க்கு எ - வீசை படிக்காரமும் ஙஉ - படி உப்புங் கலந்து தகுந்தபடி தண்ணீர்விட்டுப் படிக்காரமும் உப்பும் களாய் கொதித்தபின்பு தொட்டியிலெடுத்து ஊற்றிக்கொண்டு முன் கழுவிவைத்திருந்த தோலைப் படிக்காரத்தண்ணீர் ஆறவிட்டு அதில் தோய்த்துத் தோய்த்துத் தொட்டியில் ஊறவைக்கிறது. அந்தத் தோலை ங-நாள் காலமே காலமே திருப்பிக் கொடுத்து எடுத்து இரண்டுகாலிலும் கயிறுகட்டி வெய்யிலில் காயவைத்துக் காய்ந்தபின் தோலைச் சுருட்டி அடித்துச் சக்கரம் போடுகிறது.

இப்படிக்கு-வீராசாமிமுதலி.

Referring to the several Native processes of Tanning recorded above, the Jury may briefly (to afford) some clue to their comparative merits) touch upon the general principles which regulate similar processes in England.

Liming.—the Pits containing the Lime water, or milk of Lime, of three or four different strengths, are arranged together in a series; the softened and washed hides are introduced first in the weakest lime Pit, and, after having remained there one or two days, are transferred to the next in strength, and so on until the hair and epidermis yield readily to the touch, and the hides present indications of a sufficient action of the Lime; during the whole of this process it is necessary to "handle" the hides daily, to equalize the action of the Lime. The handling consists in taking the hides out of the Pit, squeezing and allowing them to drain for an hour or two, after which they are returned to the Pit. The Lime water should be well stirred each time the Hides are returned to the Pit after handling.

The time required for the Liming of Hides varies from one to two weeks, and for Sheep and Goat skins from two to five days. The time being dependant on the texture of the Hides, and the state of the atmosphere.

The practice of covering Hides with *Lime Paste,* rolling them up, and then immersing them in the Lime water, appears to be unknown in England, and seems calculated to realize all the evils attendant on over Liming, and there can be no question that such an over use of lime is pernicious; for reasons before given over Limed leather is loose, light, and spongy, features exhibited in too many of the native Tanned Leathers under Report. On the continent of Europe Lime is not universally used. The softening of the epidermis, and roots of the hair, being effected by means of acid solution—an acid liquid is prepared by digesting spent bark in water for five or six months, until the liquid becomes as sour as ordinary vinegar. Acid mixtures besides detaching the hair and epidermis, without injury to the Hide, prepare it at the same time by swelling the pores of the Hides, to receive the Tannin. While alluding to this subject it may be observed, that *if any lime* be allowed to *remain in the Hide,* when placed in the Tannin solution, the Leather will be rendered *hard and inflexible.*

The Jury may now proceed to offer a few remarks on the next process, the application of the Tannin to the Hide.

In this process, as generally practiced in England, Hides are first introduced into an infusion which has been previously almost exhausted of its Tannin, and are after this, subjected gradually to the progressive action of several stronger infusions, until the Hides are perfectly tanned; the usual test of which is the absence of the white streak in the middle of the section of the Hide. Some Tanners complete the process in the pits, by the use of the Tannin solution only, and others by introducing a lit-

tle ground bark between the Hides while in the pits. During the finishing period of the process of passing the Hides through the Tannin infusions, they should be taken out frequently and 'handled,' that is suffered to drain thoroughly, the last Hide taken out being the first returned to the Pit.

It is believed that the free access of air to the Hide when draining has an injurious effect. The manner of drying Hides, after the Tanning, is one which, simple as it appears, requires care and intelligence, Hides dried too slowly in damp places, are liable to mildew, while those dried too rapidly, or which have been exposed to the sun, become hard and brittle.

Hides should be dried under cover with a free current of air and good ventilation. Whilst the Hides are drying they should be taken down daily, and heaten with wooden mallets to compress their tissue, and render them more compact in substance.

The old Tanning process in England occupied a period frequently of 18 months. The present system is completed within 12 Months.

In the best leathers the relative position, and arrangement, of the fibres, after receiving the Tannin, is as nearly as possible the same as in the fresh Hide or skin.

The section of a piece of inferior leather, prepared by the *quick* process, presents a much more perpendicular structive of fibre than that of leather properly tanned. This is occasioned by the Hide becoming swollen in one direction only, by sudden immersion in a strong Tannin infusion, and not returning to its original form again.

There are some other point in Tanning worthy of notice.

1. The constant agitation of the Hides and Skins while in the Tannin infusion, and thorough draining of the Hides when removed from one infusion to another.

2. A warm Tannin infusion in preference to cold?

3. The exclusion of Atmospheric air from the Pits; for tannin exposed to the influence of water and air forms Gallic and Ellagic acids; which acids perform no part in Tanning.

4. If the Hides are *not crowded* in the Pits they will tan better and sooner.

5. Is the Leather to be Tanned so as barely to secure a sale in the Local market, or is it to be so tanned as to secure *a firm, solid, durable leather*?

The Jury have offered the above general remarks in connection with the several specimens of Leathers submitted for their examination, and Report, with the view of exciting enquiry and discussion, and so giving some stimulus to a Branch of manufacture, which, as now generally followed, is, it must be admitted, in a very unsatisfactory condition.

G. W. Y. SIMPSON,
Reporter, Class XVI.

To the Secretary Madras Exhibition.

Sir,—I have the honor to acknowledge the receipt of your letter and in accordance with it, to annex a short description of the process by which the birds sent to the Madras Exhibition were preserved.

Had I possessed the time I would also have done, what I can now, only suggest might be accomplished, if the Committee should think it worth while, which is, to have birds in all the different stages of bird preserving take off by the Photograph.

The appended description of the process of bird preserving having been drawn up very hastily, is thus difficult to be understood in some parts, as an apology for which I must state that it had to be done on the line of march, whilst proceeding from Bungalow to Bungalow.

I have the honor to be,
Sir,
Your most obedient servant.
FRANCIS DAY.

Nugger.
Feb. 17*th* 1857.

The specimens of birds sent by me to the Madras Exhibition were collected in Mysore and the Deccan, and are not intended as a perfect collection of any tribe, but merely as specimens of bird skins, as those from the East Indies are not numerous in British Museums, all sent were prepared by myself, for which purpose, the only requisites are, a penknife or scalpet, pair of scissors, hook suspended by a cord from the ceiling, needles, thread, cotton or tow, bradawl and arsenical soap as a preservative for the skins, and which is far superior to any other known, if it is wished that the birds should be even set up. The next best bichloride of mercury, or corrosive sublimate, causes them to be brittle and increases the difficulty of stuffing. The plan pursued in preparing the foregoing specimens was as follows:—first the bird's mouth having been opened, by gently pulling the upper and lower bill assunder, two incisions are made with the penknife, in the inside of the upper jaw, from behind forwards, one along each side of the palate, dividing both the soft and hard, these are joined together in front and the whole of the palate being now detached, except its most posterior part, it is easily pushed backwards, which being done, the mouth is filled with cotton, to prevent any fluid exuding from either the nostrils or mouth, during the process of skinning, which would most probably destroy the specimen.

Placing the bird on a clean sheet of paper, and gently pushing the feathers away from the right and left of the breast bone, which is here only covered by skin, an incision is made through the skin from the most anterior, to the most posterior extremity of the breast bone and along its most

elevated part (the heel of the sternum), the skin is detached from off the muscles of the chest (pectorals) partly by pushing the fingers between the two, or assisted by the knife should the cellular tissue attaching the skin to the flesh, be very dense; this having been done on both sides, a pair of scissors having blunt extremities should be inserted along the front of the breast bone, just before the merry thought (interclavicular bones) and by it the neck should be divided, being careful not to include the skin. The hook which is fixed by a piece of whipcord from the ceiling, is now to be inserted between the merry thought and breast bone, passing completely from one side of the bird to the other, so as to have a good hold, and the bird is to be thus suspended at about level with the operator's chest. The skin can now be easily detached off each shoulder, and whatever of the neck remains undivided may be completed by the knife, at this period the neck is altogether detached (except by the skin) from the body, and the operator has to proceed with his skinning backwards, towards the tail, in which process he will first come to the wings, next to the legs, and lastly to the tail.

The skin covering the muscles of the wings is everted, proceeding as nearly to the outer extremity of the wing's bone (humerus) as is possible; the tendons of the muscles are to be there cut through, and the muscles cleared from the bone, which is to be divided at its inner extremity, or that nearest to the bird's body; the same rule applies to the leg the bone of which is to be left, the same as the wing bone was; and on having proceeded as far as the tail, the end of the vertebral column is to be cut through, by which the body will be left suspended, the skin of the bird remaining in the operator's hand close to the tail on the upper surface and extremity of the back bone are two pea shaped bodies (oil glands) which must be cleared away, and all the fat should be removed from the inner surface of the skin; a little cotton ought now to be placed inside it, for the purpose of preventing the feathers adhering to the skin during the process of finishing the head and neck. Skinning the neck and head is the most difficult part of the process. The extremity which was detached from the body (the root of the neck) should now be securely fixed to the table, by a bradawl, and the skin everted like the finger of a glove on being drawn off, and the operation proceeded with by gently dividing the attachments between the skin and the neck by short strokes of the knife, until the skull is reached, over which as the skin is tighter more care is requisite to prevent the skin being torn, and no force must be now employed, prolonging the dissection forwards, and on either side; the ear is arrived at the skin covering the inside of which being continuous with that of the body, (the membrana tympani of all birds is covered with a thick layer of mucous membrane, a prolongation of the skin) it may be drawn out intact, in some species of birds (as the Tringæ) this is difficult; then it may be divided as close to the skull as possible, and the forward dissection continued. The eyes are the next part reached, the conjunctiva has to be cut through, by which (a sort of thin skin) they are adherent to be eyelids, and the eye is exposed; if the dissection is carried a little further the bill is approached, beyond this the operator must not proceed, for if he should he will detach the skin from the skull, and the specimen will be spoiled.

The back of the skull (occipital portion) must be cut off with a knife, detaching the neck, and occiput, from the rest of the skull, by this, the brain becomes exposed and through the hole in the skull thus formed the brain is to be removed, the tongue and palate should be now cleared from the mouth.

Only the eyes now remain to be removed, and considerable care is requisite, not to burst the eyeballs, the knife must be carried around the eyeball, between it and the orbit, by which all the superficial attachments will the divided, it should then be passed behind the eye, from above (inside the orbit) and the deeper ones cut through, after which the eye intact, can be easily drawn out, arsenical paste is now to be rubbed over the whole of the inside of the skin of the head and neck, and the orbits filled with cotton—the most difficult part of all is without doubt returning the skin over the skull, for now it is inside out, and practice is required for this purpose; first the skin from the front of the skull should be very gradually returned over the back portion, and sides, from the inside as far as practicable, then keeping the extremity of the birds bill firmly held between the finger and thumb of the left hand, the skin may be gently returned by the right hand into its natural position.

Skins of ducks and other birds with large heads and small necks cannot be so treated, the neck in them must be divided as close to the skull as the operator can proceed from the insides, this is to be finished by an incision made through the skin in the middle line from above, below, at the back of the skull through which the head may be brought, and the skinning completed as before described. The whole of the inside of the body must be rubbed over with arsenical soap, and some cotton wrapped round the bones of the legs to preserve them their natural size. Tha bones of the wings should to tied together at about the same distance they were at when the bird was alive—some flesh still remaining on the wings, has to be removed through an incision made along their inside for that purpose, the arsenical paste must be rubbed in.

No. 606.

All the flesh having been now removed from the body, the wing and leg bones and skull being the only bony portions retained, it is now necessary to make a skin; about this, unfortunately, few appear

to know how to proceed, the skin should be stuffed out to about the size of the bird *but no more*, whilst the neck must be distended to its natural size, for if the skin from each side adhere together, consequent on no stuffing being inside, it is almost useless subsequently to attempt to stuff them, a piece of stick (or thin bamboo,) should be taken, a little less than the bird's natural length, this should be wrapped round with cotton or tow, so that a body may be formed thus:

This is gently pushed into its proper place. The extremity marked *A* going into the skull, that marked *B* resting against the tail, a little loose cotton is placed along its sides, and the skin sewn over all; a little cotton is also placed inside the mouth, the bills tied together—the skin should be encircled by a piece of paper sewn to the proper size until it is dried, which may be done by placing it in the sun.

FRANCIS DAY.

Ahmednugger,
Feb. 17*th*, 1857.

The stuffed Birds exhibited although containing no rare specimens, yet form a very interesting collection; the specimens have been prepared with great care and skill, and are in excellent preservation. The Jury attach a very useful memo: describing the several processes of Bird preserving by Francis Day, Esq. The Jury award honorable mention.

G. W. Y. SIMPSON,
Reporter, Class XVI.

CLASS XVII.

PAPER AND STATIONERY, PRINTING AND BOOK BINDING.

JURY.

The Honorable Sir H. C. MONTGOMERY, *Bart.*, *Chairman.*
C. F. CHAMIER, Esq.
W. EVANS, Esq., M. D.
P. R. HUNT, Esq.
W. R. ARBUTHOT, Esq.
SOOBROYALOO NAIDOO.
Rev. P. PERCIVAL, *Reporter.*
Rev. T. BROTHERTON.
H. SMITH, Esq.
H. FORTEY, Esq., M. A.
JAYARAMA CHETTIAR.

LIST OF BOOKS, PAPERS, &c.

Manual of Gardening of Southern Indian by R. Riddell, Esq.
Pope's first lessons in Tamil.
St. Mark's Gospel in Telugu.
The Third Book.
English First Book.
The young Communicant's guide in Tamil.
Pope's first Catechism of Tamil Grammar.
A conversation on the origin of Hindoo Caste in Tamil.
Tamil questions in mental Arithmetic.
New Testament History.
Spiritual teaching, American Arcot Mission.
First Geography in Telegu.
" Dinavartamani" in Telugu and Tamil.
A Sketch of the Coins of Mysore with (44) forty-four Illustrations.
4 French Books.
3 Black Books from Hyderabad.
3 Do. do. from Musulipatam.
Paper and Card board manufactured at the Peralore Paper Mills.
Medical Journal in Hindustani edited by Dr. SMITH, M. D
1st and 2nd Book with Tamil Vocabulary.
3rd do.
Tamil lessons in sheets.
Map of India.
English lessons in sheets.
1st do.
2nd do.

The list prefixed to this report will at once shew that the contributions to the department under notice are very limited, both as to extent and value. Looking at the small collection with reference to *utility* the specimens of paper and card-board manufactured at the Peralore Paper Mills claim the first attention. The twenty kinds of white and colored paper sent from the above place are bound up in a volume. It is to be regretted that the specimens were not sent in the *ream* with *weight* and *price* attached ; as in that case some idea might have been formed of the prospect there may be of a supply of indigenous paper for commercial and literary purposes.

The specimens of printing, in English, French, and the Vernaculars of this country, sent from various Establishments are not numerous ; nevertheless among them are found some excellent examples of the art. The works sent from the American Mission Press in Madras are got up in a style equal to that attained by the best printers in Europe.

One or two of the Vernacular books, executed with a view to artistic effeet, are singularly beautiful ; a fact the more remarkable, since the type was cast by Native Artificers, and the works turned out by Native Printers. Some of the French books from the Pondicherry Press are very well printed.

Two specimens of book binding from the American Mission Press merit special notice, they are bound respectively in Morocco and Russian leather. The execution is not quite so neat as work done by

the first class workmen in London—that cannot be expected as the binders here have not the same opportunity of practising the art—but they are very well done, and the charge is about 50 per cent below London prices.

There are several specimens of Lithography from Mauslipatam. The Jury think some of them well executed, especially those representing animals.

Specimens of Vernacular Journalism in Tamil and Telugu are exhibited. The English notice of the head of " Dinavartamani," such being the name of both papers, may be here inserted as the best exposition of the Editor's purposes in the conduct of these periodicals : " This Journal is designed to convey interesting and useful information on such topics as are usually contained in those of Europe ; and thereby to promote the advancement and civilization of the Hindoo community." The Journals contain two or three specimens of word engraving executed by a student of the School of Arts, who, when he engraved the blocks under notice, had been under instruction only three months. The Journal is beautifully printed on good paper, contains eight pages small folio, and is published weekly at the small sum of four annas a month.

The Jury in making this report of the articles they have been called to examine, are of opinion that the specimens of printing and binding from the American Press are entitled to the recognition of the General Committee : and they beg therefore to commend the subject to their consideration.

P. PERCIVAL.

CLASS XVIII.

REPORT ON WOVEN, SPUN, FELTED. AND LAID FABRICS, SHEWN AS SPECIMENS OF PRINTING OR DYEING.

JURY.

J. Binny Key, Esq.
Major T. A. Jenkins.
W. E. Cochrane, Esq.
E. Lecot, Esq.
Captain W. R. Newlyn,
R. Barclay, Esq.
N. C. Mooroogasem Moodeliar.
Sirdar Jung Bahadoor,
H. Tolputt, Esq., *Reporter.*

It is a matter of regret to the Jury, that the manufactures exhibited in this Class so feebly represent the Dyeing and Printing of this country; althongh possibly many Fabrics such as Madras Handkerchiefs and Conjeveram cloths, which might legitimately have been included in this Class, have been exhibited in Class XI as specimens of weaving.

Probably, few arts have made so little progress in India since their introduction, as those of Dyeing and Printing; still, crnde and imperfect as are the modes of Dyeing practised, the brilliancy and permanency of some of the simple colours produced, are unsurpassed in any part of the world. This may be in a great measure owing to the freshness of the raw materials used, since it is a well ascertained fact that many of the Dye stuffs imported into Europe, particularly those required for the more sensitive colours, deteriorate considerably during a voyage. The application of chemical science to this art during the last 20 years has, however, given the European dyers an immense advantage by enabling them to produce a rich variety of delicate intermediate shades, utterly unknown in India.

In the art of Printing perhaps less progress has been made than in that of Dyeing. The Palampores exhibited in this Class, are in styles as old and as universally known as the Chinese " willow pattern," and all of them are printed from rudely cut blocks. There is also a blotched appearance noticeable in these fabrics, arising evidently, from a want of ordinary attention to the face of the blocks during the process of printing.

The application of wood engraving as taught in the School of Arts to designs on blocks for printing, would doubtless in course of time become a profitable branch of industry. A constant succession of new designs to keep pace with the changing tastes of the people, would enable the Printers of this country, with the advantages they possess in cheapness of labour and printing material, to compete with the European Printers in the production of the cheaper kinds of block-printed fabrics now imported.

The Jury do not consider any of the articles exhibited in this Class deserving of reward. They would only mention that the Palampores exhibited by Agi Emmendi Masulipatam are better printed than those from the Rajahmundry district.

H. TOLPUTT,
Reporter.

CLASS XIX.

TAPESTRY INCLUDING CARPETS AND FLOOR CLOTHS, LACE AND EMBROIDERY, FANCY AND INDUSTRIAL WORKS.

JURY.

The Right Honorable Lord HARRIS.
M. GALLOIS MONTBRUN.
H. A. MURRAY, Esq., *Reporter.*
FINDLAY ANDERSON, Esq.,
J. B. NORTON, Esq.,
J. KELLIE, Esq.,
J. ROHDE, Esq..
Colonel M. CARTHEW.
P. VEERAPERMALL PILLAY.
SALAR OOL MOOLK BAHADOOR.
W. E. COCHRANE, Esq.,
MADAR OOL OOMRAH, BAHADOOR.
HAJEE AGA MAHAMED BAKER SHERAZEE NUMAZEE.
A. COLE, Esq.,

In considering the merits of the principal articles exhibited in this Class, viz. Embroidered Fabrics and carpets, it will be necessary to judge them by very different standards, the former being intended more for ornament than use, the latter more for use than ornament, again work that can be executed well by the hand in Embroidery it would be impossible to produce by the machinery and coarser materials employed in the manufacture of carpets. This being the case it is only requisite that a design for embroidery fulfil the following conditions. That the pattern be well proportioned to the space covered, that the lines be graceful and flowing and that the colours be well blended and harmonized. A carpet should when placed in the position it is intended to occupy not only serve as a covering to the floor, but as a ground work to support and set off the Furniture and occupants of the room to the best advantage, and not be of such a nature as to attract the eyes, to the detriment of other objects; to obtain this result it is necessary that the general effect be considered rather than the individual details The pattern should be proportioned to the size and distributed equally over the whole extent. All strongly pronounced, or hard forms should be avoided and the pattern should either spread from a central form, or be dispersed over the entire surface not forming decided lines either lengthways or breadthways. The forms used should also have a flat treatment, all attempts at shadow or relief being avoided.

As a rule, Carpets having a centre and border, are good in effect especially in large rooms. The general result produced by the combination of the different colors employed in the design of a carpet, should be negative, when bright colors are used, it should be in small quantities and they should be so arranged and proportioned as to neutralize each other. The primary colors when employed in the leading forms should be attended by their secondaries, and when the secondary colors are made use of for the principal patterns, the ground should consist of the tertiaries.

All colors should be separated from those in juxtaposition by lines of black, white, or yellow.

One fact shown by the present Exhibition is much to be regretted, namely: That some specimens of carpets evince a decided inclination on the part of the makers to attempt an imitation of European patterns; if this be persisted in, it must inevitably produce the degeneration of that manufacture of which the natives of India have for ages possessed an unrivalled reputation, the beauty and truthfulness of their designs have been the bases on which many of the generally received rules regarding design and color have been founded. The carpets made in this part of India are the Setrangi or cotton carpet commonly used for tents and somewhat resembling venetian carpetry in texture. A similar carpet with a cotton web but covered with woollen instead of cotton thread, and the pile carpets generally on a cotton ground but with silk woollen or cotton pile as in the Axminster and Turkey carpets.

The principal manufactures of the better discriptions of woollen carpet are at Ellore in the district of Masulipatam, at Bangalore and Mysore,—carpets

similar to those of Ellore are also made at Warungul a town 86 miles N. E. of Hyderabad in the Deckan, at Masulipatam at Mayaveram in the district of Tanjore and probably in small quantity elsewhere.

The wool about Ellore is of a harsh description and of short staple, that of Mysore is of much better quality, and white wool is more readily procured in Mysore ; when a soft carpet, as for an Ottoman is required, at Ellore, it is necessary to procure Lamb's wool.

In texture the best Ellore carpet is very superior to that procurable elsewhere, a square space containing $80 \times 80 = 6,400$ distinct threads composing the pile white in a Bangalore or Mysore carpet the same space would contain only $20 \times 20 = 400$ such threads ; there is therefore sixteen times that amount of work in an Ellore carpet that there is in a Mysore one of the same dimensions. Besides this, the web threads of an Ellore carpet are stronger than those in a Mysore one. Of late years a practice has been introduced into the Bangalore carpet of using a hemp woof, this is objectionable when hard twisted thread is employed as it cannot, then be driven up as a softer substance might be, if the hemp were used for the weft well washed and not hard spun it might be advantageous, indeed the importance of having a weft less yielding than cotton is instanced in the carpets made under the orders of S. Nummiah Naidoo and A. Sashia Gauroo of Masulipatam by the Ellore and Masulipatam weavers for the enterprizing house of Wastan, Bell & Co. of Bond Street, this house has paid attention to the importation of the best qualities of these carpets and in order to avoid the inconvenience of sending carpets in long rolls and to secure the carpets from the effect of unequal strain in folding they send out *flax* weft, which is used either in the weft only, or in the weft and woof, two specimens of carpets so constructed are exhibited and are certainly of excellent quality. Carpets with woollen weft, as in the Turkey, are not made in this part of India, (but one said to be from Mirzapoor) has this peculiarity. The Mysore carpets exhibited this year are inferior. In general it may be remarked that the wool of the Mysore carpet is dyed with very little care, and this is very remarkable in the *grounds* in which patches of various shades are discernible. The same remark on the inequality of colouring is applicable to the silk carpets exhibited. Two carpets with cotton pile from Warungul shewed want of attention in washing out the surplus dye which has run and stained the ground.

GOLD EMBROIDERY.

Mysore.

Two magnificent Elephant Joohls are exhibited No. 4205, by Kristniah and No. 4261, by Lutchmen Row.

These are beautiful specimens, both have a crimson ground diapered with gold in the centre, surrounded by a border. The latter though less costly is the best design. In No. 4205 Black Elephants are introduced. These produce a very spotty effect, and spangles are made use of to such an extent as to give to the tout en semble an appearance tawdry in the extreme. The border of No. 4261 is remarkably good, the ground being of gold with a crimson pattern; figures are skilfully introduced in which silver is employed with good effect. No. 4195 A. Shamianah, by Thunnegee Row is well designed, consisting of crimson silk diapered with gold supporting a centre ornament and corners, the whole being surrounded by an exquisite border of gold with the pattern in crimson, black and silver.

No. 9089 is a piece of gold embroidery exhibited by W. E. Underwood, Esq. manufactured by Jetting Row, worked in crimson velvet and having the middle portion diapered with a finely designed pattern in gold with star centre and corners surrounded by a border. This work is more bold and free in treatment than any other exhibited, the centre and corners are magnificently imagined, the border in which small quantites of green are introduced is very good. No. 4202. A Palankeen cover by Venkajee Row is cleverly designed containing more varied effect; crimson, black, green and silver being used on a gold ground.

The centre ornament is very good surrounded by a crimson and gold edging with a crimson fringe.

The whole design shows a very skilful treatment of a simple form.

No. 4203 is a gold cloth, or Musnud with pillows by Kristniah—with the pattern in crimson and green, the centre has the character of a diaper, the corners and border are crimson with a pattern in gold. This work shows a good arrangement of colour, but the effect would have been enhanced had the green employed been darker and less yellow. The fringe is dark orange, this colour does not in any case either contrast or harmonize well with crimson or gold.

No. 6691. This is a very satisfactory work in crimson and gold exhibited by the Resident of Hyderabad, the corners and centre remarkably good, but principally worthy of notice for the masterly way in which the green lines in the border are introduced ; their effect is perfect, harmonizing beautifully with the crimson and gold employed on the embroidery.

No. 4201. Exhibited by Sooba Row, Bangalore, although some portions of this work are pleasing the whole design is not good, the centre wants power and the orange fringe employed (as in No. 4203) is in bad taste.

No. 6124. Exhibited by the Local Committee of Hyderabad, is crimson with a border and corners in gold well arranged; the effect is much injured by the mean looking fringe surrounding it.

No. 4208. Exhibited by Burmajee Row, Bangalore, consists of a cushion and pillows in crimson, gold and green; the green fringe around the cushion has a pleasing effect.

SADDLES AND SADDLE CLOTHS.

Of these the best exhibited are Nos. 4230, 6745 and 2228.

No. 4230. An Elephant Saddle exhibited by Sooba Row, is very rich in appearance consisting of a gold ground diapered with crimson green and white. The border consists of the same colours, edged with gold and crimson, and surrounded by an orange fringe.

No. 6745. A Horse Saddle exhibited by Poonnaghee Row, Bangalore, is good in design having a crimson centre with a scale pattern diaper in gold thread, with corners, a border composed of crimson and gold, and an orange fringe.

No. 2228. A Horse Saddle, Chennagee Row exhibitor, though better than some exhibited is poor in design.

EMBROIDERY ON MUSLIN.

No. 6387. A Gold Doopatah exhibited by Nabob Salar Jung and the Hyderabad Local Committee is handsome, the arrangement of the spangles, both as to design and color, is very clear; the border consists of a very good shawl pattern.

No. 9236. Two pieces of gold and silk embroidery exhibited by the Poodoocotta Rajah worked on muslin consisting of a diapered pattern in yellow and crimson silk, with gold thread and spangles. The effect is most beautiful.

CARPETS, SILK, WORSTED AND COTTON.

Six silk carpets are exhibited.

Nos. 1573, 6171, 5173, and 5172 are the best in design.

No. 1573, exhibited by the Tanjore Local Committee is very beautiful consisting of a centre and border. In the middle is star composed of red, blue and yellow; the colors are so well balanced and black lines are employed so judiciously to separate them from each other that (although very bright) all gaudiness of effect is prevented. The star is surrounded by a pattern filling the whole central space in which the colors are so skillfully blended that no one predominates over another. The border is well proportioned to the centre harmonizing with it. The white introduced is well placed.

No. 5173, exhibited by the Local Committee of Tanjore is very good in design: the color of the silk is very bright. The pattern is Geometrical, the colours used red, blue, yellow, and a little green, are well arranged, separated by black lines, a little white being also introduced. Nos. 6171 and 5172 are also good; in the former white is used more liberally than in any others exhibited and with good effect. The designs of the two other silk carpets seem intended to produce as gaudy an effect of colour as possible without any consideration either of harmony or contrast.

ELLORE.

WORSTED CARPETS.

Nos. 4114-4115. Exhibited by S. Nummiah, are very fine specimens of design, and are good examples of different ornamental beatment.

Nos. 4114. Although of greater price and less striking in appearance than No. 4115 is much better calculated for wear. The design of No. 4115, of Persian character is excellent. The pattern consists of a beautifully designed centre ornament and corners in orange blue and green supported by a dark crimson diapered ground. The colours are well arranged excepting that the orange predominates rather too much over the blue; the primaries employed, viz. red and blue, are of a neutral tone: the whole is surrounded by a border in which white has been employed too liberally. In No. 4114 the colors used are almost the same as in the above with the exception of the border in which a cream colored ground is introduced, edged and divided from the centre by colored bands. The design of the whole carpet is excellent, the colors being remarkably well distributed.

NORTH ARCOT.

WORSTED CARPETS.

Nos. 1132, 1133, and 1134, exhibited by Kristniah. Of these No. 1133 is the best, the centre is very rich in colour, the border consisting of coloured bands well arranged contrasts effectively with the centre portion. The ground of the pattern is of a dark purple hue: this sets off the brighter colours of the design to advantage.

In No. 1132, the colors are well grouped, but the design is of too large a character for the dimensions of the carpets. The border is good in itself but unsuited in the size of the details to the pattern it surrounds.

In this carpet and in No. 1133 the colour employed for the ground is of a mottled description: this is judicious as it prevents the heaviness in appearance generally remarkable when a great mass of dark color is employed.

HYDERABAD

WORSTED.

Of the carpets exhibited the most satisfactory are Nos. 6119 & 6110 exhibited by the Hyderabad Local Committee, the former has a colored pattern and a white ground and a wide border rich in colour contrasting well with the light centre.

No. 6110, has a diaper pattern on an orange ground. This diaper would have a very scattered effect were it not for the introduction of skilfully arranged right lines. The border is particularly good, it consists of several bands well proportioned to each other and well coloured.

Of the Cotton carpets exhibited the best designed is No. 6108 from Warungul, these carpets have a much better effect when viewed at a distance than on a closer inspection.

The dyes employed do not seem to be fast, the yellow especially has in many places run into the white ; notwithstanding this disadvantage, it is probable that these carpets may be serviceable for bed room purposes.

TANJORE.

WORSTED CARPETS.

The large carpet No. 4596 exhibited by H. Hurry Row is not good, and would appear to less advantage if placed on the floor than in the position it now occupies. The design consists of a monotonous repetition of a hexagonal form, the arrangement of colour is faulty, the border is good but too narrow in proportion to the size of the carpet, the design with exception of the border is an imitation of a bad English manufacture.

BANGALORE.

A large carpet No. — exhibited by Mr. Rhode is better in treatment, though this shows a want of systematic arrangement and unity in design : the border is remarkably good.

No. 4598, is a well designed carpet, the centre pattern being the same as in the silk carpet, No. 5173, more contrast is required in the colour, the lines are of too uniform a tone, the yellow lines especially want power, the border is rather narrow.

Two worsted rugs from Mirzapore are worthy of notice.

MYSORE.

Six long pile carpets are exhibited, the best being No. 6819, a pair exhibited by the Bangalore Local Committee : these have a good general effect of a grey tone, the patterns employed are of too large a description for the size of the carpets. The texture of the manufacture is coarse but they are remarkably low in price.

A carpet made by the prisoners in the jail at Amherst is deserving of notice although far from good in design and dull in colours.

MATTING.

The specimens exhibited of this manufacture are few in number and inferior to the samples sent in 1855, they are nevertheless creditable and exhibit care and ingenuity in manufacture, those which appear most deserving of notice are No. 223 exhibited by Nellicherry Sevarama Iyer having a centre with a pattern in black bordered with crimson. At either end is a wider border containing brown, yellow, crimson, black and white.

No. 205 by Nellisherry Sevarama Iyer of Paulghaut is similar in design.

No. 216, a crimson mat by the same exhibitor with a pattern in black and white.

No. 227 by the same, is a dark colored mat of good design.

No. 227 and 224 by the same maker are also good.

EMBROIDERY.

The Jury are indebted to
Lady MONTGOMERY,
Mrs. UNDERWOOD, and
Mrs. KELLIE,
for their kind assistance in this department of the Report :—

There is a marked improvement in the Embroidery exhibited this year compared with the specimens contributed to the Exhibition of 1855. It is pleasing to find that the rewards given in this class and the sale of most of the articles, have had the effect of stimulating to greater exertion. There is on the present occasion a great variety of patterns and much taste and elegance of design which, combined with the moderate price, in most cases, affixed to the articles have led to their rapid sale.

One of the richest pieces of embroidery is No. 9043, a child's jaconet muslin frock, made by the girls in the Military Female Orphan Asylum. The work on the body and sleeves is very elaborate and the tucks on the skirt show from their neatness that the girls in this institution are taught useful as well as ornamental work.

An embroidered collar, pair of sleeves and bands worked for Mrs. Binny Key, at the same institution are also deserving of notice.

A quilted basinette cover by the Jewesses of Cochin is neatly executed and pleasing in effect, though there is a harshness and angularity of design in the pattern.

LACE.

The best specimens of the manufacture are No. 3454 and No. 3464 lace and imitation Valencienes lace from Quilon. This collection contains a considerable variety of patterns, but they are inferior in quality to those exhibited in 1855 from the Nagercoil Mission School Travancore, and the Edyengoody Mission School Tinnevelly,

The thread in use at Quilon appears to be rather coarse.

CROCHET.

There are large and interesting contributions of this manufacture from several quarters ; the best collection is from Mrs. Sewell's School at Bangalore, there is a great variety of patterns and several of them are rich and tasteful ; the whole collec-

tion is deserving of notice ; more particularly two collars worked by a Christian girl Anna and priced respectively Rs. 3 and Rs. 2 and a chemisette by a Canarese girl Esther priced 5 Rs. The work upon this is very fine and the pattern very elaborate.

No. 4194. A piece of edging from Mrs. Sargent's School, Bangalore, is neat and tasteful.

Some very fine knitting is exhibited from the Native Female Central School, Madras, particularly five collars, of which No. 7405 is the best.

There is a large and creditable contribution of Crochet Anti-macassars made by the girls in the American Mission Boarding School at Jaffna. Most of these are made of Jaffna Cotton.

Some good samples of braiding and worsted work are exhibited from the Civil Institution Madras; the best are a cushion marked No. 2, a richly colored pattern upon a dark ground, and a pair of slippers No. 17.

BONNETS.

Some tasteful Bonnets are exhibited by Mrs. Harding, the best of which is a white one, priced 30 Rs., neatly trimmed.

The Jury recommended the following awards.

GOLD EMBROIDERY.

jore Carpets" &c.

To Nos. 4205 & 4261. Two Gold Embroidered Elephant Jhools....	A first Class Medal each.
To No. 4195. A Shamianah, by Thunnajee Row.	A first Class Medal.
To No. 9089. A piece of gold embroidery exhibited by Mr. W. E. Underwood and manufactured by Jetting Row. ...	1st Class Medal.
To No. 4202. An embroidered Palankeen cover by Venkajee Row.	2d Class do.
To No. 6691. A piece of embroidered work exhibited by the Resident of Hydrabad.	1st Class do.

TANJORE CARPETS.

To No. 1573......................	1st Class Medal.
To No. 5173......................	2d do.

ELLORE WORSTED CARPETS.

To Nos. 4114, 4115. Exhibited by S. Nummiah, ...	1st Class Medal.

EMBROIDERY.

To No. 9048. A child's jaconet muslin frock by the girls of the Military Orphan School, ...	Reward of 25 Rs.
To a quilted Basinette by the Jewesses of Cochin,...	Honorable mention.

CROCHET.

To the collection from Mrs. Sewell's School at Bangalore,................	Reward of 20 Rs.

KNITTING.

To the specimens from the Native Female Central School Madras,	Do. 15 Rs.

CLASS XX.

ARTICLES OF CLOTHING FOR IMMEDIATE PERSONAL OR DOMESTIC USE.

JURY.

Colonel F. A. Reid, c. b., *Chairman.*
F. J. Lushington, Esq.
Major H. J. Nicholls.
T. G. Clarke, Esq.
Major J. Macdougall, *Reporter.*
Captain J. W. Hay.
Major J. Jenkins.

Specimens of Burmese Hats made from the spathe of the large bamboo. Interesting. These are light and well adapted for tropical climates.

A few hats and a bonnet sent by the Rajah of Vizianagrum as specimens of an approach to the straw bonnet manufacture of England. Much room for improvement.

Some Anti-macassars, have been reported on by another Jury.

The same remark applies to Bonnets &c.

Mr. Crowe, Boot and Shoe-maker of Vepery, exhibited some very creditable specimens of his art; as also, did Mr. Egan of Bangalore, and Narsengadoo and Polalados of Muslipatam.

Soldiers' Boots sent by the Local Committee from Bellary, are most excellent of their kind, unusually cheap. This consignment, is deserving of especial notice.

F. A. REID,
President.

CLASS XXI.

CUTLERY AND EDGE TOOLS.

JURY.

Major J. Maitland.
Major J. Macdougall, *Chairman*.
Captain J. W. Hay.
Captain W. C. Baker.
A. Blacklock, Esq., m. d,
R. Kennedy, Esq.
J. Urquhart, Esq., m. d.
W. B. Wright, Esq.
J. Rohde, Esq., *Reporter*.
Major G. W. Simpson.
Colonel P. Hamond.
A. Lowe, Esq.
Lieutenant Colonel G. Balfour, c. b.
Lieutenat Colonel T. T. Pears, c. b.
A. Hunter, Esq., m. d.
H. F. C. Cleghorn, Esq., m. d.
Lieut. Colonel F. C. Cotton.
General F. Blundell, c. b.
Mr. Commissary J. Curran.
Mr. J. C. Paterson.

In this series were exhibited a large collection of tools chiefly from the Government workshops in the Gun Carriage Manufactory and Arsenals of Madras and Vellore; a few articles from the Masulipatam Arsenal were exhibited ; several excavating tools as well as Carpenter's planes were exhibited by the Railway workshop at Paulghautchery.

It appeared to the Jury that in the manufacture of most of the artificer's tools more attention had been devoted to finish, than to more essential properties. In many the proper forms had been neglected ; several had been made up without due regard to strength where it was most required, while some which the jury tested gave way. It was evident to the members present that the tools had not generally been made up by persons who understood the working of them. From the prices having been omitted in many cases, they were not able to express any opinion in regard to the economy of such tools as seemed suitable. There were several planes made at the Arsenal and Gun-carriage Manufactory, and a large number exhibited from the Railway workshop at Paulghaut, in most of these it was evident that a most important quality in a good plane that of retaining its form had been lost sight of in the formation of the stock. In a well made plane, the medullary rays of the wood should be perpendicular in the centre of the plane, the annual rings being consequently as nearly as possible in the direction of the sole, any twist would in this case be in one direction only, and the sole could with great facility be brought true. The Jury are aware that in planes made up in England by inferior makers,—by makers the Jury do not mean vendors or as they call themselves manufacturers, who often have a stock of good and bad mixed, the former are selected by those who know any thing about a tool while the name is quite

enough to induce others to buy the rubbish—this precaution is often neglected, and that where wood has been exceedingly well seasoned, and the instrument is not liable to exposure a tool so constructed may answer its purpose ; but in articles evidently made up for exhibition they naturally expect that such precautions should be attended to. The Jury regret to observe, that there was no originality displayed in this department; there was not an instance of improvement on any of the ordinary native tools, which are often very effective, and with a little alteration might be improved, almost all were copies, and these, form by no means good English patterns.

To illustrate more particularly these remarks the Jury would refer to their notes on articles specially observed in the order in which they found them placed 5433/5434 2 pairs of scales, these were not correctly adjusted, and attention to minor matters as the connection of the chains with the scales had not been attended to.

5230. A drill bow when very moderately bent flew to pieces, it seemed to have been formed of cast steel drawn down.

A garden trowel. This seemed a very clumsy article, but might be useful in transplanting,

5497-98. 2 Pairs of garden sliding scissors. In these the construction of the jaws does not allow a branch to be received sufficiently low down for the tool to be effective; in the same tool made and exhibited by Major Maitland, No. 4977, this error is avoided and that article appears to be of a superior description.

3 Cold chisels were tested on a bar of Beypoor iron, but the edge did not stand.

5565, Callipers No. 2. In these the points were too square, consequently, when opened to any extent, the heel instead of the point of the tool would come in contrast with the object to be gauged.

Chisels, socket. These are as slight as firmer chisels while their great length would require their being of greater substance than the English socket chisel with which they were compared. The face of the chisel was not true.

5511. Tank digger's Mamooty (Col. Ottley's). This would be an excellent tool for certain purposes if more substance were given where the helve is fixed : as it is, it would rapidly destroy the wood while no leverage could be used.

5501. Pitch fork. This is not made on a proper pattern, and in use would be found inconvenient.

5385. 81. Axes. The blade being of the same substance throughout the breadth would not answer for rough work and would be found inconvenient : Axes for carpenters and general work should have greater substance in the middle. This is most important in felling axes of which an excellent form No. 4778 to 4781 is exhibited by Major Maitland but with this serious defect.

5509. A Mamooty " English pattern." The neck of this should be swaged ; when forged square and bent, iron has a tendency to become hollow in the middle and to crack in the outer angles ; by swaging the neck so that the thickness was greater in the middle much greater strength would be obtained.

5963. A country saw when bent remained in that position, it has evidently not been hammer hardened or planished as such saws usually are.

4861. A wrench. This is a cumbrous affair and not sufficiently strong or well proportioned.

4838/4839 Pliers. Gave way on being put to a test by no means severe.

4977. A well made and to all appearance effective garden scissors or shears : very creditable.

4964. A spade probably twice the weight of an English spade.

4798. Bill hook. In this the edge and blade generally was much too thick.

A wrench made after a pattern represented in a Mechanic's Magazine some years ago, the object of the several parts of this is evidently not appreciated, the screw is much too far from the end of the jaws, which are too weak, while the screw which elevates the tail of the jaw and causes it to act as a lever is proportionately much too near the fulcrum.

4043. A Sapper's knife and bill-hook from Masulipatam were of good quality.

The Railway excavating tools were good specimens of iron work, but were highly finished and of course not such as would be issued for use.

There were a large number of hammer heads chiefly from the Government workshops, the appearance of which was good, the faces however were very unevenly tempered.

2 Centre bits exhibited by the Arsenal had the cutting point equi-distant from the centre with the outer edge of the opposite side, the point too was not sufficiently long, nor was its outer edge parallel to the centre of the tool, consequently the diameter of the hole would vary after each sharpening, and the point would soon have described a circle inside that described by the outer edge of the opposite side.

A digging fork of iron made after a pattern of one of Parkes's Patent cast steel flexible forks was very creditable in point of workmanship, it was light and handy, but being bent by the hand remained in that position while the English steel fork flew back to its original form. It will form part of the duty of the Jury on horticultural implements to report on the effectiveness of this tool.

The Jury having illustrated their remarks on the defects observable in many of the tools must now express their satisfaction with several articles exhibited by the Vellore arsenal, particularly, the vices which appeared as good as, and better finished than, articles of the description ordinarily met with in England. They would have been pleased to see this article constructed free from the very serious defect of the English vice as commonly constructed (with the whole strain on the upper half of the thread of the screw and the box containing the screw in a position the least favorable to strength and endurance) and they would suggest to the makers an improvement in this respect, whereby the screw is maintained in a position parallel to the strain instead of forming an angle with it as at present, the shoulder of the screw box in this case bears evenly by a socket joint against the back of the vice.

A hand vice from the same Arsenal and a pair of shears or large scissors equally showed that good instruments may be made with a little attention in the country. A Ratchet drill from the Gun-Carriage Manufactory though considered by the Reporter and some others of Jury as cumbersome was approved by the practical members of the Jury: this article was well and truly made; it is a tool in common use in every machinist's shop in England, and from its efficiency and the facility with which it may be applied in any position ought to be introduced into every workshop in this country; there can be no doubt that with proper appliances these tools might be constructed of excellent quality at small cost in the country, the shot gauges seemed well and accurately made. The Jury had no means of testing them, but were informed that they had been found accurate, the hammer heads were as already stated of good appearance.

PRIZE FOR SMITH'S TOOLS.

From the Railway workshop were exhibited a large collection of smith's tools, hammer swages, top and bottom tools, tongs &c. sufficiently well made, but without any pretention to finish and just such as a working establishment would prefer; in these utility was combined with the least possible expenditure of labor, they were generally on a scale too large for common work, but afford an excellent series of patterns for Native smiths to copy on the scale best suited to their wants. The Jury would award a second class medal to Mr. Wright for this collection, and they consider the vices exhibited from Vellore entitle the maker to the same distinction.

PRIZE FOR KNIVES.

The knives by Aranachellum of Salem maintain their character, but the prices put upon them are such as to preclude their ever competing with similar articles of European manufacture; as specimens they certainly surpass any articles of the kind produced in the country, and the Jury would therefore award a second class medal to the maker.

Major Maitland exhibited some friction blocks which were to all appearances excellent. In these the bushing consists of a number of rollers packed in a grove, where they are secured by a cap or washer; the block rolls ronnd the axis on these rollers instead of rubbing upon it. It is to be hoped that such articles for facilitating labor will be available, so that heavy masses may be adjusted without risk and the enormous expenditure of time, noise and stupidity with which they are at present put in their places both in these and the Ratchet brace. The Jury think the Gun-Carriage Manufactory have made a good selection for introduction.

Unless the Jury had an opportunity of seeing the whole process of manufacture of several of the articles exhibited, or knew the real cost of production, they could not express any detailed opinion on the economy of making such in the conntry: they very much doubt the practicability of competing with England in the manufacture of such cutting tools as chisels, plane irons &c., but they are decidedly of opinion that with a little more attention to the most suitable forms all the heavier tools may be produced in this country better suited to its wants, and better in quality than those ordinary supplied from England: the iron of this country is far better suited to this purpose than the English iron. Steel, it will still be desirable to import for articles in great demand, it would be advisable to divide labor to a much greater extent than is ordinarily done, and more pains should be taken to turn out the work finished from the anvil. The Jury would particularly urge attention to one branch of Manufacture for which the native hand seems particularly suited, that of file cutting; at present files are cut in the intervals of other work by smiths, but they are generally such as would not be saleable: by reducing old files to blanks and re-cutting them a very considerable saving wonld be effected in every workshop; if hand cutting were found impracticable, probably machines might be advantageously introduced as in the case of Ravulli's Files. The wootz (gulti) of Indian manufacture is very well adapted for rough files, though often ill-suited for sharp cutting edges.

The Jury are of opinion with reference to the display of tools from Government workshops, that it would be desirable that a really good selection of the best descriptions suited to the country should be made in England, and that a complete series should be available for samples; for it is very evident that at present the makers in this country have not good models to guide them: they would also desire to see a more general knowledge of the princi-

ples on which tools should be formed, and they would particularly commend to all who have the superintendence of workshops. Mr. Holtzapffel's work on tools and mechanical manipulation as giving very full instructions on all points most necessary to those whose knowledge must be much more diversified than is needed in an English workshop.

A very great drawback to the making of good cutting tools is the want of good steel; very little of superior quality finds its way to the Indian market, Aranachellum's cutlery is generally believed to be formed from sword blades, some of the heavier articles only being of Indian steel.

The Jury would again express their hope that attention may be paid to the improvement of the native forms of tools, few instruments are so effective as the Adze (Badidi or Badsti) of the Northern Circars, and one somewhat different in form in use in Mysore and the broad chisel in use about Paulghaut, only one such adze is exhibited : the Jury did not observe any such chisel as they refer to.

JOHN MACDOUGALL,
Chairman.

CLASS XXII.

IRON AND GENERAL HARD WARE.

JURORS.

Major J. MACDOUGALL.
Captain W. C. BAKER.
A. BLACKLOCK, Esq.
R. KENNEDY, Esq.
J. URQUHART, Esq, M.D.
W. B. WRIGHT, Esq.
JOHN ROHDE, Esq.
Major G. W. SIMPSON.
Colonel P. HAMOND.
A. LOWE, Esq.
Lt. Col. G. BALFOUR. C.B. *Reporter.*
Lt. Col. T. T. PEARS, C.B. *Do.*
A. HUNTER, Esq. M.D.
H. F. C. CLEGHORN, Esq., M.D.
Lt. Col. F. C. COTTON.
Mr. Commissary W. CURRAN.
Mr. J. C. PATERSON.

The articles exhibited in this class may properly be arranged under two distinct heads; viz. those for mechanical, and those for culinary or household purposes. It is to be observed in the case of many articles coming under the first head, that the attention and skill of the manufacturer has been directed more to the finish, than to the design or ultimate utility of the work; and with the exception of some locks, in no single instance can claim be laid to novelty, either as regards construction or design. On the contrary it would appear, that in many instances, the exhibitors have not even availed themselves of the best models or patterns.

The articles in the first section have been contributed principally by Government workshops, and other large establishments; viz., the Gun Carriage Manufactory, the Grand Arsenal, the Vellore Arsenal, the Railway, the Dowlaishwaram Workshops, and Pondicherry. Speaking generally, those from Vellore are superior in excellence, whilst those from the Grand Arsenal are the more numerous; and those from the Gun Carriage Manufactory most diversified in pattern. The tempering of the Vellore tools is somewhat defective; but otherwise the whole are well made.

BLOCKS, IRON AND WOOD.

Blocks, Iron and *Wood,* exhibited from Dowlaishwaram, the Grand Arsenal, Gun Carriage Manufactory, and Pondicherry. These are all creditable, and more or less excellent in design and finish. Those from Dowlaishwaram are six in number, aud comprise one pair of single, one pair of double, and one pair of treble sheaves. The whole are well made and of great strength; and the hooks well formed. The rings of the double and treble blocks to which the ropes are intended to be secured, would however be better placed in the centre, than as at present placed in the blocks.

The blocks from Pondicherry comprise one pair of iron, and one of wood. The iron blocks are well made and strong, though perhaps rather disproportionately so, the hooks being over large. The wooden blocks are also well made, and the sheaves strong and serviceable.

The above remarks are applicable in some measure to the blocks from the Grand Arsenal, particularly Nos. 5561 and 5562; these latter are strong and have brass sheaves, but would be improved by the application of shackles. The workmanship is good, but the best models have not been selected, nor have modern improvements been adopted.

The blocks from the Gun Carriage Manufactory numbering from 4918 to 4929, are varied in kind. The workmanship is good, and the rates at which turned out, very moderate; all are of considerable power, but as with those from the Grand Arsenal, a better selection of patterns might have been made.

HAND CUFFS.

Of different patterns exhibited by the Gun Carriage Manufactory, and Grand Arsenal. Those numbered 4141, 4942, and 5506, are well turned out. The workmanship, as in most of the articles exhibited by this Establishment is good, but the construction of the spring locks is very defective, rendering the opening of them too easy.

LOCKS, PADLOCKS.

Padlocks, Iron and brass.—Door locks, Almirah locks, and Drawer locks, are exhibited by the Gun Carriage Manufactory and Grand Arsenal; all are creditable as to workmanship, and those from the manufactory moderate in price. The greater portion of them however are easily picked. Of the padlocks made up at the Grand Arsenal, Nos. 5576 and 5577 are strong well made, and very difficult to unlock; displaying in their construction a creditable amount of ingenuity. These are the invention of Overseer Lee, employed at the Grand Arsenal. There is also a padlock from Vellore, which though strong and well made, was easily opened by using a two pronged fork.

498. Six hinges cast at the Gun Carriage Manufactory, entire, without joints, are deserving of notice, on account of the small amount of labor required in their construction, as compared with that of the old design.

FORGE BELLOWS

No. 1999. Forge Bellows from Bangalore exhibited by Dr. Hilbers, without laying claim to novelty of construction, are neat and portable, and would doubtless be found useful in the field.

RATCHET WRENCH.

No. 4969. Ratchet Wrench of improved construction from the Gun Carriage Manufactory : a useful and ingenious tool, well made and moderaately priced.

WRENCH SCREW.

No. 4976. Wrench Screw for 4 sizes of nuts : a handy tool, easy of adjustment, made at the Gun Carriage Manufactory.

WEIGHING MACHINE.

The next article which claims attention is a weighing machine for treasuries, proposed by W. H. Bayley, Esq., and made up at the Grand Arsenal. The beam and pedestal exhibit workmanship of a high order, and highly creditable to those employed.

WEIGHTS, BRASS AND TIN.

5442 to 5461. Weights in brass and tin from 16oz, to 56fb, also from $\frac{1}{8}$ of an ounce up to standard Indian maund of 3200 Rs. weight ; also a set of weights of pállams and tolas. The above are neatly turned out, and manufactured in the Grand Arsenal.

5433 to 5435. Scales copper weighing. Of various sizes and kinds made at the Grand Arsenal, tolerably accurate, sufficiently so for ordinary purposes, but not highly finished.

Nos. 5238 and 5239. Vices Bench and Stand from the Vellore Arsenal, are deserving of great praise, and fully equal to English manufacture. The hand vices would however be improved if not case hardened.

Nos. 5235 and 5236. Plyers cutting and common from Vellore ; workmanship very fair, and plyers well finished.

Nos. 5237, 5255, 5256, Stock Drills with Drills. Carpenters squares with steel Blades from Vellore, very well finished.

No. 5242, Braces Carpenter with bits from Vellore; well made, but has the eye soft. The hammers from that Arsenal are well shaped, but the faces appear soft, as if not sufficiently steeled.

The chisels, firmers and gauges made up at the Gun Carriage Manufactory and Grand Arsenal are very fairly turned out, as also the adzes, which are of a good pattern ; those made from Europe steel being more free from cracks than those manufactured from the country article. As a general remark applicable to most of the above class of tools, it may be observed that the tempering appears much too low.

Nos. 5387 to 5392, Augers Iron carpenters; these are well shaped, but not highly finished.

Nos. 5397. Braces Smith with bits ; are strong, but rather coarsely made. The same remarks are mostly applicable to the other tools belonging to the class now treated of.

In the second section of Class XXII comprising Native Brazen utensils, there are few articles worthy of notice; in fact with the exception of a spirit lamp with cups for cooking purposes, a cabin lamp from Pondicherry, and a few other articles from the same place, the whole list is made up of jemboos, cups, goglets and cooking pots, also a few bells and hookah bottoms. This collection has been chiefly contributed by Hydrabad, Madura, Malabar and Chingleput, and deserves notice chiefly on account of cheapness; many of the articles are well turned and well got up, particularly those from Madura and Chingleput. A set of cooking pots from Salem are well made.

Nos. 9277 and 9281. Comprizing cooking cabin lamps. A spirit lamp and cabin lamp from Pondicherry, are articles of rude construction and but indifferently finished; they possess indeed no novelty of design, and are far inferior to many articles for the same purposes purchaseable in the Bazaars; in addition to which they are high priced.

Some wire sieves and wire net for meat safes is also exhibited from Pondicherry. The manufacture of these articles appears still to be in its infancy in India ; the whole being very coarse, and far inferior to the Europe article ; but still, with care and attention and the cheap labour obtainable in India, we may hope shortly to see great progress made.

AWARDS FOR CLASS XXII.

The Jury recommend that the following Public Establishments should receive honourable notice for the general excellence and variety of articles exhibited.

Grand Arsenal of Fort St. George.

Locomotive Department and Workshops of the Madras Railway.

Gun Carriage Manufactory.

Dowlaishweram Foundry and Workshops.

Artillery Depot of Instruction.

Arsenal of Bangalore.

Arsenal of Vellore.

Messrs. Bulliard and Godefroy of Pondicherry, both deserve honorable notice, for the metallic cloth exhibited by them.

Overseer Lee of the Grand Arsenal, and Serjeant Chalk of the Gun Carriage Department, deserve second class medals for their ingenious Locks.

Sub-Conductor Skinner and Serjeant Hayes of the Gun Carriage Department, deserve honourable mention for the general superiority of the workmanship of the articles exhibited respectively by them.

G. B.

CLASS XXIII.

WORKING IN PRECIOUS METALS IN THEIR IMITATIONS, JEWELERY AND ALL ARTICLES OF VIRTUE, AND LUXURY, NOT INCLUDED IN OTHER CLASSES.

JURY.

The Right Honorable LORD HARRIS, *Chairman and Reporter.*
M. GALLOIS MONTBRUN.
The Honorable WALTER ELLIOT, Esq.
FINDLAY ANDERSON, Esq.
Lieutenant Colonel F. C. COTTON.
J. B. NORTON, Esq.
Lieutenant Colonel W. P. MACDONALD.
J. ARATHOON, Esq.
G. J. SHAW, Esq., M. D.
NANA THAKOOR.
H. A. MURRAY, Esq.
HAJEE AGA MAHOMED BAKIR SHERAZEE, NEMAZEE.
A. COLE, Esq.
R. W. NORFOR, Esq.

The articles exhibited in this class are inferior both in variety and in merit to those exhibited in 1855.

They occupy portions of four cases.

Among the manufactures in silver the filagree work from the Hydrabad Territory attracted the greatest attention.

A pándán or spice and betel tray No. 6,698 consisting of a central box surrounded by eight smaller ones, the whole contained in a large tray or tabbak manufactured at Yelgundel, and a Kulmdàn or inkstand both partially gilt were particularly deserving of commendation. The former valued at Rs. 217-14-0 was bought by the Resident for the Museum at the India House. The latter was purchased at the Exhibition for Rs. 138-11-0.

A gilt vase No. 6,142 from Hydrabad of silver open work handsome in form but coarse in workmanship afforded a good specimen of this kind of Native work.

Next in merit was the filagree work from Travancore. But the articles consisting of bracelets, pins, a bouquet holder (the latter exhibited by T. Madava Row, Dewan Peshcar) Nos. 3,476 to 3,488 were inferior in design and fineness of workmanship to those of Hydrabad.

A filagree casket in the shape of a fish resting on a filagree stand of similar form No. 9,029 exhibited by Anthiah Chetty of Madras was noticed for its quaint and not inelegant conception.

The best article of silver plate was a vase exhibited by Messrs. Orr & Co.

The design seems to have been taken from different sources not always in keeping with each other and is wanting in simplicity and lightness. But many of the ornaments are elegant and natural when viewed in detail particularly the foliage at the base. The figures of deer are well modelled and display considerable truth and spirit. The whole was executed by Native artists.

The workmanship is of the best description and is highly creditable to Mr. Orr's establishment.

The Jury recommend a Medal of the first class for this article.

Mr. Scriven contributed a claret jug of silver and various other articles. The form of the jug was good but the workmanship was somewhat inferior and wanting in finish.

Sri Vencatesa Chetty exhibited a number of articles of silver such as figures of animals, birds, figures holding lamps, more curious than beautiful. Among which a metallic mirror, No 5691, deserves remark as a specimen of the kind of mirror in universal use before the invention of glass. A similar article was also contributed by T. Madava Row, No. 3503 from Travancore, and Lt. Puckle from Bangalore exhibited a third.

A gold jeddepilli sent by Chokalingam Chetty, No. 9897, was a good ordinary specimen of the handsome ornament worn by Hindu women on the back of the head. The same person also contributed four quaint looking silver spoons with ornamented handles terminating in Hindu deities like old apostle spoons.

A silver jug so constructed as to contain 3 different liquids at once and exhibited by Somasoondrum Chetty was noticed for its form and purely Hindu style of design and ornament.

A model in silver of the Madras Light House was exhibited by Captain Baker, and appeared to be a correct representation of that elegant structure.

The principal exhibitors of Electrotype were Messrs. Lowe & Co., and Scriven & Co.

Some dish covers of the former were of very good

workmanship, but the smooth surface of such articles renders the process of easier execution than when applied to elaborately chased patterns as in the article next noticed.

A centre piece for a table representing a fountain with large pieces of coral lying at its base exhibited by Mr. W. E. Underwood, was a very fair specimen of electrotype work executed by Lowe and Co.

The jury is of opinion that Messrs. Lowe & Co. are deserving of a second Class Medal.

A case exhibited by Mr. Western of articles electrotyped by himself was considered to be a creditable specimen of Auvatem art. The gold work on a dagger handle and mounting was particularly good. Some native lamps in silver were also deserving of notice. The jury recommend a 2d Class Medal to this exhibitor.

Mr. Deschamps exhibited a number of ornaments of Parisian manufacture in mother of pearl and gold, marble, &c.

Mr. Binny Key exhibited several articles of good jewellery in the shape of brooches and other articles of female ornament, some of which particularly a large and very fine amethyst cameo of Cleopatra appeared in the Exhibition of 1855.

An extensive stock of English made jewellery displayed by Messrs. Orr and Co. did not call for particular notice.

The native jewellery sent by Anarda Chetty of Malabar and Jaggematha Batten of Madras contained many tolerable specimens of articles in use both in European and Native Society but none of such marked excellence as to call for special remark, unless an exception be made in favor of a gold filagree bracelet by Ananda Chetty.

A pair of bracelets and other articles formed of stones set in silver were exhibited as specimens of " an attempt to get rid of the sameness of appearance in the Cuttack Jewellery." But in this object the projectors do not appear to have been successful.

The stones which were of an ordinary description being set in silver had a heavy commonplace appearance and the lightness and delicacy so conspicuous in the Cuttack filagree jewellery were wholly lost.

The Jury desire to notice with approbation a small silver Hookah in which the Sirposh was supported by an elephant's trunk rising from the head which was inserted into the Hookah.

Although in no wise conspicuous for workmanship, the design is commendable for its novelty and elegance of application. The mouth piece was in the form of a bird.

Among the articles sent from Travancore were some gold and silver wire which though entered in the catalogue under the head of Embroidery appear to fall properly within the scope of Class XXIII. These which are numbered 3446 and 3447 appeared to be so delicate and fine that the Jury requested Mr. Mitchell to measure their diameters by the aid of the mecrometer of a very excellent microscope, the result showed that of the gold wire to be fr. $\frac{1}{542}$nd to $\frac{1}{528}$th of an inch or Decimal ·00185 to ·00190 and that of the silver to be fr. $\frac{1}{565}$th to $\frac{1}{542}$nd of an inch or ·00177 to ·00185, the slight difference being owing probably to an inequality in the aperture of the drawing plate, the result of imperfect construction or of abrasion from use. It is probable that the same hole served for both kinds of wire and that the silver being more elastic expanded slightly after passing through the hole.

This result must be considered very creditable to native workmen with inferior tools when it is considered a feat in England to have drawn a silver wire of great length by means of machinery through a hole in a ruby of ·00330ths of an inch in diameter, the nature of the plate ensuring uniformity of thickness throughout.

MADRAS EXHIBITION 1857.
MADRAS LOCAL COMMITTEE,
20th March 1857.

MY DEAR SIR,—The enclosed Memos. from Mr. Underwood were unfortunately omitted from our Catalogue and I promised him to send them to the Reporters of the various Juries with a request that they might be inserted in the Reports. Would you therefore kindly ask Lord Harris, if he would think proper to insert these in Class 23, of which His Lordship is Reporter.

Your's very truly,
J. T. MACLAGAN.

H. A. MURRAY, Esq.

MEMORANDUM.

The fountain was manufactured by Mr. Lowe and I understand he purposes taking out a patent for it. It was made for the Exhibition.

MEMORANDUM.

The Silver Ornament made with stones inserted in them, was a trial to get rid of the sameness of the appearance of the Cuttack Ornaments.

MADRAS EXHIBITION 1857.
MADRAS LOCAL COMMITTEE,
31st March 1857.

MY DEAR SIR,—I have just sent to Major Snow three articles of Jewellery (two bracelets and a broach) made by Juggenatha Butten, and exhibited by the Local Committee. They are the things we purchased with part of the money subscribed for the purpose, and the delay in forwarding them was caused by the late date at which they were ordered. Under these circumstances, and as the maker is anxious they should be reported on, I hope the Jury in Class XXIII of which Lord Harris is Reporter will be able to notice them, though they are late in appearing.

Your's very truly,
J. T. MACLAGAN.

H. A. MURRAY, Esq.

CLASS XXIV.

GLASS.

JURY.

Major J. Maitland.
Lieutenant-Colonel C. A. DENISON, *Chairman.*
Major W. K. WORSTER, *Reporter.*
Captain H. W. RAWLINS.
The Honorable A. E. HARRIS.

The Jury have only to notice two contributions to this Class; a very neatly engraved and gilt dessert service of French manufacture from Messrs. Griffiths and Co.; and a stained glass circular "light" by Mr. Deschamps.

Although articles of this description are not likely at present to influence native art, the Jury would expressly recognise the good will of the Exhibitors in their desire to afford illustrations of these particular branches of manufacture.

(H.)
W.

No. 1. A glass service for 12 persons with ice plates, all of which are surrounded with neatly cut patterns of flowers and foliage, and subsequently dead gilt—the borders being in burnished gold.

2. A circular light about 3 feet in diameter of blue and ground glass cut in the usual ornamental "*fan light*" pattern.

CLASS XXV.

CERAMIC MANUFACTURES, CHINA PORCELAIN, EARTHENWARE, &c.

JURY.

W. U. Arbuthnot, Esq. *Chairman.*
B. Cunliffe, Esq.
Capt. H. W. Rawlins, *Reporter.*
R. O. Campbell, Esq.
Capt. G. C. Collyer.

The art of making Pottery and Porcelain has received the patronage of Royalty, and the attention of eminent men from the earliest ages. It was first introduced into Europe from China, Japan, and Persia by the Portuguese and Dutch; who imported splendid collections of the finest manufacture. They were afterwards superseded by the English, A. D. 1600, who established their first entrepôt at Gombron in the Persian Gulf, and traded largely in Porcelain, until the enterprize of De Botticher discovered the composition of the manufacture, which had long been a mystery known only to the Chinese. The way in which the discovery was made curiously illustrates what important results often spring from the most trifling sources. De Botticher was of an enquiring disposition and drew conclusions from the simplest facts. One day noticing the unusual weight of his wig, he found that instead of being powdered with flour some white earthy mineral had been used. This he analyzed, and immediately discovered it was the veritable clay with which the whitest Porcelain could be made.

Great Britain, however, is indebted to Wedgewood—the lame Potter Boy—for its pre-eminence in Porcelain. His talent and industry were noticed by Queen Charlotte, who so admired the articles he made that she ordered them to be called "Queen's ware." From that time improvement rapidly followed; and now foreigners declare, that the "excellent workmanship of English Porcelain, its solidity, the advantage which it possesses of sustaining the action of fire, its fine glaze imperishable to acids, the beauty and convenience of its form, and the cheapness of its price; have given rise to a commerce so active and universal; that the traveller, from Paris to St. Petersburgh; from Amsterdam to the farthest part of Sweden; or from Dunkirk to the extremity of the south of France; is served at every inn with English ware. Spain, Portugal and Italy are supplied with it. Ship-loads are annually sent to both the East and West Indies, and to the Continent of America." There are about 190 manufactories of Pottery and Porcelain in Great Britain alone, giving constant employment to 80,000 persons, while the annual value of the articles produced exceeds 2½ crores of rupees.

It is ceitainly a reproach to the industrial character of India that the Ceramic art is so imperfect; notwithstanding the advantage derived by the example of neighbouring countries, where the manufacture has been so successful and renowned. For many centuries the Pottery of this country has been of the rudest description, and until very lately no improvement has taken place either in design or workmanship. The great mass of the people have been contented with the coarsest wares, while the cleanliness and comfort resulting from the general use of finer descriptions have been lost sight of in apathy and ignorance. This is the more extraordinary, as it is well known, that the best raw materials for Pottery abound in India, whilst the people themselves are quick in imitation and dexterous in works requiring lightness of hand and delicacy of touch.

The Government of this Presidency, seeing the importance of this branch of industry, and the necessity for its improvement in connexion with the welfare and progress of the people, have within the last few years established a School of Instruction and Design at Madras; where many young persons are taught the higher branches of the Potter's art; and the value of scientific tuition, aided by the practical application of European machinery. Much good has undoubtedly resulted from the School, but much still remains to be done, which must emanate more directly from the people. The Government can only sow the seed. The nurture of the germ must depend upon the energy and industry of the recipients. In all national advancement the people must help themselves and rely upon their

own exertions. It is to be hoped that the native aristocracy of this great country, by a philanthropic and personal influence, will endeavour to develope the resources of their districts in this useful branch of art and manufacture.

In Class XXV. there are upwards of 200 specimens exhibited of manufactures brought chiefly from the territories of Burmah and Hyderabad; and from the districts of Arcot, Cuddapah, Chingleput, Coimbatore, Nellore and Madras. They embrace articles in Porcelain; stone ware, glazed and unglazed; white, brown, and other coloured earthenware; Terra Cottas for vases; Flower Pots, Ballustrades, Encaustic tiles, water pipes, and other miscellaneous articles of domestic and ornamental use. There is also a large collection of the raw materials, the joint contribution of several parties. The Jury especially draw attention to a valuable series of Porcelain earths from Bangalore exhibited by Lieut. Puckle, and they beg to recommend that Officer to "honorable mention."

The principal ingredients for pottery are clay and flint, but their proper combination can only be determined by practical experience. The best clays are colourless and free from oxide of iron. They stick to the tongue and emit a peculiar smell when wet. By gentle burning they become lighter, but heavier and harder when exposed to intense heat. Clay shrinks from $\frac{1}{12}$th to $\frac{1}{8}$th when dried and burnt. Both in Europe and China the process of washing the clay is conducted with great care by merchants, whose business is to prepare the material for the potter's use. Too much attention cannot be bestowed on this part of the manufacture, and carelessness in it is one of the principal causes of failure in Indian pottery. The Chinese were so convinced of the necessity of properly selecting and manipulating their clays, that they kept them for years in damp state before using; and every head of a family considered it necessary to make a large collection of the pure material, to bequeath to his descendents and to perpetuate his name.

The Kaolin, a decomposed granite or Felspar, bears the strongest heat, and is procurable at Arcot, Hyderabad, Trivatoor, Tripetty, Naggery, Bimlapatam, Cuddapah, Bangalore, Chittoor, Madura, Cochin, and indeed almost any where in the vicinity of the primary granite rocks. This substance, however, is but little used by the natives, from their ignorance of the mode of giving it strength and from the intense heat it requires. Excellent clays abound in India, and the following are a few of the best localities.

White plastic clay, similar to the Ball clay of England, is procurable at Conjeveram, Chingleput, Pelaveram, Cuttapaukum, Cuddalore, Coringa, Cuddapah, and the Neilgherries.

Tough yellow plastic clay, at the Red Hills, Poonamallee, Chingleput, and Cochin.

Grayish white, at Streepermatoor, Tilaveram, Bangalore, and the Neilgherries.

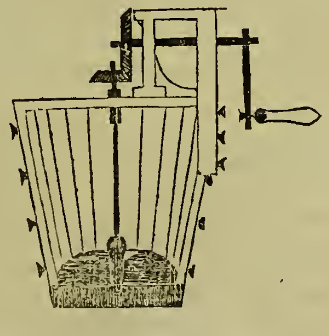
Red clays, at Burmah, Bezoarah, and the Guntoor District.

True fire-clays, or white slaty shales at Streepermatoor, Cuddapah, Tripasore, and Chingleput.

Clunch or Bastard Fire-clay, at Madras, Poonamallee, St. Thomas's Mount, and Paupautangulum.

Nothing can be more unsatisfactory than the slovenly way in which the native potters select their clays and prepare them for the wheel. They only use the toughest description of brown alluvial soil and are quite indifferent as to its composition. They seldom dig deep enough, and many of the best ball and pipe clays are neglected, from the want of knowledge of their working properties. Particular care should be taken in tempering the clay before using it, and in seeing that it is thoroughly cleansed. In European potteries great care is bestowed on mixing the ingredients with the purest rain or river water. To free clay from gravel, lime, roots and impurities it should be blended or blunged with a large quantity of water till it acquires a thick creamy consistency. It must then be run off or decanted through a sieve and exposed for a day or two on a large paved surface called a sun-pan, till it begins to dry and crack, when it should be collected into a heap and subsequently tempered—common brown clays are sometimes run out to dry upon a level piece of ground sprinkled with sand.

The best flint or silica is of a dark gray colour. This is not obtainable in India, but white quartz is a good substitute, and is procurable in all primitive formations. Quartz bears intense heat and must be burnt in a furnace till red hot, when it is plunged into cold water and becomes brittle. It should then be ground to an impalpable powder either with the common native hand-mill or by flint-mills worked by coolie or steam power. The following kind of Flint Mill



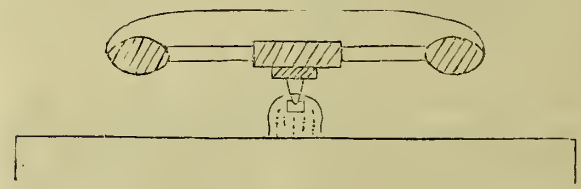
has been in use in the Madras School of Arts for some years and is very serviceable for grinding glazes. A pint of pure clay should weigh 24 ounces, and the same measure of powdered flint 32 ounces. It is by these specific gravities that the proportions of the ingredients are generally determined. Immediately before using the paste it should be well tempered or wedged to expel the air bells; other-

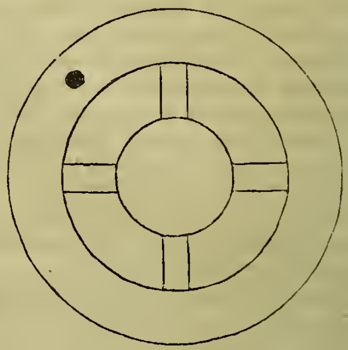
wise the composition would expand, by heat and spoil the Ware.

The great defect in native pottery is the want of a stony ingredient. There is too much alumina, and not enough flint or silica to open the pores of the clay, so that its moisture may evaporate. In consequence of these defects country pottery can hardly bear the heat required even for the commonest glaze, as the clay begins to lose its shape before the glaze is sufficiently melted. There are two ways of correcting this evil. The one is to procure a finer description of clay by digging deeper into alluvial formations. The other is, to mix with the mere unctuous clays fine sand, road dust or some silicious powder without any lime in it.

The Native Potter's Wheel,

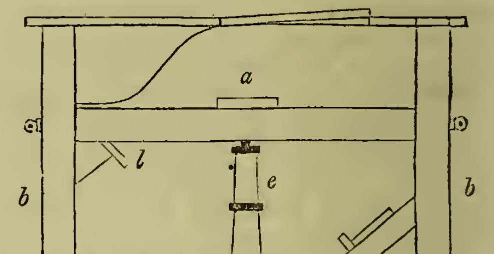
Section.





is a defective and clumsily constructed implement. It consists of a wheel 3½ feet in diameter with four spokes and a rounded centre, on the under side of which is a pointed piece of hard wood on which it revolves. The support for the wheel consists of a rounded mass of clay and goats hair in which is embedded a piece of hard wood or stone with a slight depression for the axle to move in. The defects in the wheel are; 1st, its size, which requires the potter to stoop over it in an uneasy attitude; 2d, the irregularity of its speed with a tendency to come to a stand still and to wave or wabble in its motion; and 3d—so much time and labor are expended in turning the wheel that little work can be performed. Notwithstanding, however, the rudeness of the implement the native potters are expert at throwing; and some of their small wares are thin and delicate.

There is another fault in native pottery which cannot be too strongly deprecated. When the chattie or vessel has been thrown, and the neck and upper part completed; the lower portion is cut off; and after partially drying in the sun, the bottom is reconstructed by tapping and drawing out with a wooden mallet and a round stone, the thick edges of the upper part of the vessel until the orifice is closed. The clay composing the bottom of the vessel thus becomes dense and hard; while the upper portion is soft and coarse; and from being of different consistances, the article cracks and will not bear the heat required for glazing. Cheap as Indian pottery is, it would be much more so if this part of the process could be improved. A native potter rarely finishes more than 8 or 10 chatties in the day in consequence of the tediousness of separately closing by hand the under part of each vessel. In European manufactories this inconvenience is obviated by the "potter's lathe, which is a great improvement on the clumsy native wheel, and should be more generally adopted in India." The following illustration represents the potter's throwing wheel for heavy wares. Fig 2.



The dix or top *a* is placed in the middle of a strong table with a massive frame work support, *bb*, the legs of which are bound together by strong bars, *cc*. The dix consists of the head *d* of wood or plaster of Paris the spindle or axle of iron *e* and a heavy wheel *f*. Attached near the lower and the point of the axle revolves in a piece of hard stone *g*, cemented to the floor with plaster of Paris, while the upper end *h* is kept steady in a collar of brass. The thrower or potter sits upon an inclined board *k* and supports himself against the foot board *l*. Motion is given to the wheel by the feet or by a lad turning the spokes with his hand.

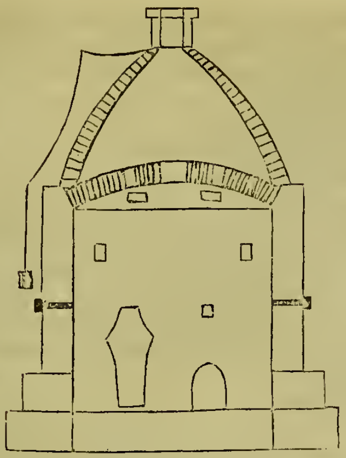
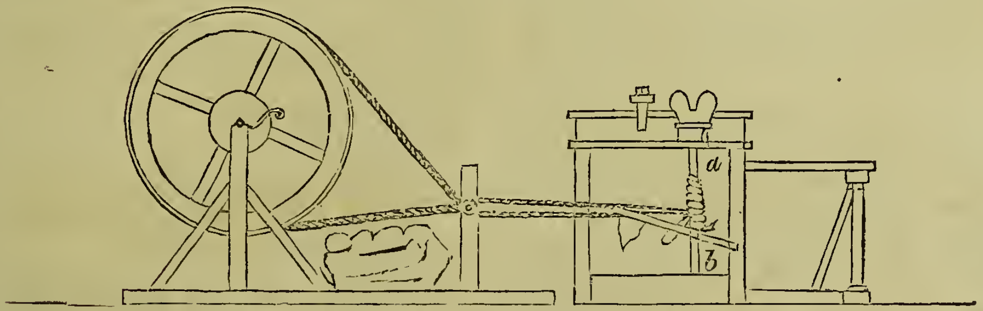


Fig : 3 is a sectional sketch of the kiln in use for burning common pottery. The ware is first carefully packed in seggers and placed in the furnace which continues to burn from 30 to 40 hours according to the thickness of the ware. The cost of constructing such a kiln would not exceed Rupees 100, and the expense would soon be saved in the diminution of fuel.

The Throwing Machine, fig. IV,



or the potter's wheel for light wares, consists of an upright shaft *a*, *b*, revolving vertically between two fixed sockets. On the top of the shaft is a flat circular board, whereon the clay is placed, and the whole is worked by a pulley and detached fly-wheel, which a boy can turn at any speed. For making circular dishes, saucers, bowls, and such like wares, a mould of plaster of Paris is used. This mould is placed on the board and sprinkled with a little flint dust. The clay required is cut and weighed, and the thrower works it about against the mould to get it into a plastic state and to expel the air bubbles. He then presses it against the mould, and with a profile gauge gives it the requisite form. It is afterwards carefully taken off the stock and placed in the shade to dry, and not in the sun where it would crack and warp. When dried sufficiently it is transferred to the common turning lathe, where all excrescences are removed, and the thickness of the ware reduced to the most accurate gauge. The motion of the lathe is then reversed, and the article is smoothed and polished ready for the furnace.

Nearly all the European machinery used for pottery can be as easily worked by hand as by steam. The different implements are so simple and inexpensive, that it is a matter of regret they have not been more systematically introduced into India. An English workmen assisted by two boys, can make 600 or 700 plates per day, at the rate of one a minute ; whereas a native potter would take a week at least to manufacture the same number of the coarsest and simplest articles. The native potters give the preference to their own rude wheel, although with strange inconsistency they acknowledge that more work, and of a better description, can be executed with European machinery. To the native potter original outlay for tools, furnaces, &c., is a matter of serious consideration. He finds it a long time before he can learn the European method, and he is put to great expense for fuel and labor before his returns prove remunerative. There is little demand among his countrymen for wares of an improved description, and it would be some time before he could produce articles which would compete with those imported from Europe.

Many native potters have been lately under instruction at the School of Industrial Arts, and have returned to their villages with a fair knowledge of some of the European methods of manufacture ; and it is encouraging to feel that a decided progress has been evinced in several Districts since the Exhibition of 1855. There are many creditable attempts at glazing, but most of them are defective in the mode of preparing and firing the wares in their biscuit state. The pottery of India may as yet be all classed under the head of soft porous earthenware. The clay undergoes but little preparation, being merely moistened with water for a

night, and then worked about with the hands or feet for a short while before use. It contains so much iron and other impurities that it will not bear exposure to strong heat. Most of the clays used by the natives for making the common red porous earthenware melt into a grey spongy slag at the temperature required for glazing. The reason is because they are not sufficiently dense. To obviate this defect, it is necessary to mix with the clay about one third part of very fine sand, road dust, or which is best of all, some of the silicious or sandy clays that can usually be found under the brown potter's clay, at the depth of 8 or 10 feet.

The materials must be well mixed in considerable quantities in the above proportions and placed in a tub, in which they should be freely blended with water and strained off through a coarse sieve upon a flat surface paved with bricks, and surrounded by a low wall. The tub should be replenished with water and materials every ten minutes and in this way two or three tons of fine clay can be prepared daily. As the washed materials subside, the water may be drawn off through a series of holes made at different heights in the wall. In this way materials may be prepared to almost any degree of fineness, and by using various mixtures of clay, colored bodies of a variety of pleasing tints may be produced. The brown clays are the most abundant, then the yellow, drab, blue, grey and white. On exposure to heat these all undergo certain changes, and as a general rule become darker in firing. The following is the usual succession of tints according to the degree of heat employed—whiteish clays, if not pure, burn to a cream color, pink or yellow. Buff colored and yellow ochrey clays, to a red. Brown and black clays, to a deep red, purple or black.

Mr. Brongniart divides clays into four classes, viz. :—Fire proof, fusible, calcareous, and ferruginous. The first class includes kaolins, white ball, and true fire clays or shales. The second is composed of buff colored and dark soapy clays, which usually contain a little iron, with alkalies which render the mass fusible. The calcareous are those which effervesce considerably with acids from containing a large proportion of earthly carbonates, particularly lime. This class includes the marls. The ochrey and ferruginous clays are most common and contain a large proportion of peroxide of iron, which renders them fusible.

The peculiar properties of clays can only be ascertained by carefully testing, examining and working with them. Some are smooth, soft or soapy, some tough and pliant while others are poor, dry and meagre many are sandy or gritty and few combine two or more of these impurities. By mixing them in various proportions different qualities of ware are produced. The smooth soft soapy clays, like the white kinds at Arcot, Bangalore and Travancore, have no strength when used alone. They require a little tough clay and a good deal of granite and quartz to be added; when they yield a strong sonorous biscuit ware that takes a good glaze. For wares manufactured from these clays, the proportions ough to be,

Washed Kaolin, ...	3 parts.
Washed tough white clay, ...	2 ,,
White granite, ...	1 ,,
,, Quartz, ...	1 ,,

Both the latter must be heated to redness then plunged into cold water and ground to a fine dust before being sifted into the liquid clay.

The brownish and yellow tough clays like those from the Red Hills, Poonamallee, Cochin, &c., require to be mixed in the following proportions:—

Tough clay, ...	5 parts.
White Quartz, ...	2 ,,
,, Granite, ...	1

The marls and calcareous clays like those from the Mount and Chingleput require the addition of Kaolins or white ball clays with less of the stony material.

They usually burn to dark buff or red colours and may be mixed in the following proportions:—

Grey marl.	4 parts.
Kaolin or white ball clay, ...	2 ,,
White Granite, ...	1 ,,
,, Quartz, ...	1 ,,
A very good Terracotta ware can be made with Cuttapaukum clay,...	2 parts.
Grey felspar from near the Marmalong bridge, ...	1 ,,

This stands great heat, and when glazed resembles the ordinary stone ware of China.

A good serviceable ware for cups, jars, bowls, plates and dishes can be made with:—

Cuttapaukum Ball clay, ...	4 parts.
White Granite, ...	1 ,,
,, Quartz, ...	1 ,,

The hard materials must be calcined, ground and sifted before being mixed with the clay.

The common brown yellow and red loams so much used by the natives require the addition of road dust or sand to give them strength, and the materials should all be washed and sifted together in the following proportions:—

Brown loam, ...	4 parts.
Road dust, ...	2 ,,
Fine sand, ...	1 ,,

This enables them to bear more heat and to stand a glaze.

A mixture of loam, ...	4 parts.
Cuttapaukum ball clay, ...	2 ,,
Road dust, ...	2 ,,

gives pleasing grey and stone coloured wares, if the materials be finely sifted together.

Some interesting specimens of Antique Pottery dug out of the old Tombs, Kairns and Cromlechs on the Neilgherries, and in the Coimbatore district, are exhibited by the Honorable Mr. Walter Elliot, and the Madras School of Industrial Arts. This pottery is of great interest on account of its undoubted au-

tiquity; the curious and often elegant forms of the vessels; the great variety of their shapes, the quality of the wares and their decorations, which bear a strong resemblance to those found in the old Etruscan Tombs sketched by Mr. Brongniart in his famous work on Pottery. The Tombs themselves have also the same general form and character as those discovered in Etruria being composed of four long slabs of stone for the sides, top and bottom; with two smaller stones for the ends of each tomb. It is reported that in two or three instances the under surface of the top stone has lately been found carved with figures, and attempts were made to procure one of those carved stones from Mr. Fraser, Civil Engineer at Coimbatore, but it was not dispatched as it would have been too late for the Exhibition. The tombs are not confined to one District.

The Pottery belongs to the class Red porous Earthenware, but is made of a finer description of clay than that now in common use, and the surface is in most cases highly polished and ornamented with wavy streaks of two or three different colors. The wavy lines seem to have been produced by scratching the surface of the red clay with a coarse toothed instrument, similar to a comb. The vessel appears to have been set aside to harden, after the surface had been smeared with white soft clay. It has then been replaced upon the potter's wheel and scraped and burnished with some hard instrument. A few of these vessels were found to be cinerary urns filled with human bones, teeth and ornaments carefully deposited there after having been burnt. In the collection, exhibited by the Honorable Mr. Walter Elliot, is a great variety of implements of iron, steel, brass, and a few coins; all much corroded. The Pottery collected by Mr. Thomas and Mr. Boswell at Coimbatore is various in shape and well finished, but not hard fired. There is no attempt at glazing or smearing, and the ware can all be cut with a knife, one of the large cinerary urns is of a yellowish clay 3½ feet by 2½ feet.

The strongest and best glazed native pottery is contributed from Burmah by the Honorable Mr. Walter Elliot, on breaking the bodies and examining them carefully, they are found to be strong, heavy in specific gravity, and close in grain, with a proper mixture of stone. Two descriptions of ware are exhibited; one, a strong pale buff colored biscuit, used for porous chatties and such like domestic vessels; the other, a dark red strong earthenware, which has been glazed with Galena, Quartz and Manganese in different proportions. The glaze is a raw one (i.e. not fritted or fluxed with Felspar and Alkalies) hardened with manganese and exposed to a great heat for several hours. The quality corresponds with the common glazed Rockingham wares of England. They are strong and serviceable though coarse in finish and quaint in shape. The Jury recommend a second class medal for this series, of which the best samples are some glazed cooking dishes, shallow bowls and lamps.

There are some yellowish white goglets and butter coolers made by Mahomed Ghouse Shereef of Vellore. The material is decayed pegmatite and the raw glaze consists of Red Lead and Felspar. The glaze is soft and crazed from the ware having been short fired, and is deficient in stone. There are some well glazed buff coloured jars made by the same person of a yellowish tough clay. There forms are elegant and praiseworthy. This ware does not require such strong heat to prevent crazing as the white ware. The jars, however, are observed to be slightly mottled from cold air getting into the furnace while the glaze was melting. Some green glazed goglets, cups, butter pots covered cups and basins hookah tops &c., are made of white Kaolin glazed with red lead, copper and felspar. They are well fired and the green colour is of a pleasing hue, Although the above wares are any thing but perfect, and are susceptible of very considerable improvement, yet the jury consider Mahomed Gouse Shereef entitled to a 2d Class medal as the best native manufacturer of Madras glazed pottery.

Several articles exhibited by Aroomooga Woodayar of Arcot are worthy of "honorable mention." Some white porous earthenware goglets, and some butter pots and dishes are serviceable and of pleasing shapes. The quality of this ware can be greatly improved and strengthened by adding ground quartz or white granite to the clay and exposing it to a stronger heat.

T. Kistna Row of Tanjore contributes a few specimens of cream coloured wares, but they are soft and rather coarse in finish.

Some red wares from Travancore are exhibited by Peishcar T. Madava Row. They are made of a fine description of clay, but are soft and short fired. A few of these articles have been painted with red lead which soon comes off, and none of them are glazed.

An interesting series of plain glazed and lackered wares is shewn from Hyderabad. The greater portion of them are made in the Raichore district by a native family of Christians, of the village of Raichore, who have long been celebrated for their superior manufactures. The clay appears to be of an excellent quality, and admits of being thrown to an extreme thinness. It is also purer and more plastic than what is generally found in use amongst the natives It is of a buff colour when fired, but the wares are short fired and will evidently not bear much heat. This is inconsequence of an excess of iron, and an insufficiency of stone, or what the Chinese term "all flesh and no bones." The jury think the Raichore collection entitled to "honorable mention."

A few of the articles exhibited from Hyderabad are painted or lacquered with sealing wax, which is bad, and has a sham effect. In the manufacture of these wares more attention has been evidently paid to superficial and ill-designed ornament than to the

quality of the material. This is to be deprecated, more especially as it is a common defect in all native workmanship. Embellishment should be subservient to usefulness, and any thing which detracts from this primary qualification should be avoided.

There is a large and miscellaneous collection of pottery from the "School of Industrial Arts," and the jury have pleasure in recording the marked improvement manifested since the last Exhibition. The Superintendent, Dr. Hunter, reports that much of this improvement is due to the zealous manner in which the pupils have been instructed by Serjeant M. Chesterfield; and they beg to express their sense of his usefulness by recommending the award of a 2nd Class medal.

Many of the articles manufactured at this establishment from the common red clay of Madras, are well finished, and there is a solidity and ringing soundness in them characteristic of good material and workman-ship. The heavier the ware and closer the grain, the stronger the pottery, and this elementary principle has not been forgotten in the above manufactures. There are some excellent specimens of vases, goglets, chatties, milk, and cheese pans, cups, saucers, jars, evaporating dishes, crucibles, cylinders for galvanic batteries and filters. Many of these articles are novel in adaptation, and most of them are very creditably finished and chaste and simple in design.

A Terra Cotta vase attracted attention from its size and pleasing shape, but it is faulty in construction, and the pedestal is slightly out of the perpendicular, aud the whole is smeared with a cream coloured paint, which does not improve its appearance and gives the idea that it was resorted to for the purpose of hiding defects.

There is also a vase made by a native bricklayer, contributed by R. Kennedy Esq.,—The shape is tolerable but the material is brittle, and the pattern somewhat elaborate.

Some Italian roofing tiles of a new form introduced by the late Captain Best, and exhibited by Mr. Rohde, attracted attention. Also some encaustic tiles, well made and of pleasing designs, together with several patterns of neat cornices, picture frames and large balustrade tiles.

The well known firm of Messrs. Griffiths & Co., of Madras exhibit a beautiful Porcelain Tea service manufactured by Kerr and Co., of Worcester, who call it their "Egg-shell China." It is an imitation of the Serres Porcelain, and is exhibited to shew the perfection to which the potter's art may be brought by industry and science, with only the same raw material as abounds in India.

The Jury beg to close their remarks on Class XXV. by appending a few receipts kindly furnished by Dr. Hunter, for the manufacture of some of the articles exhibited from the "School of Arts," and they express a hope that the native potters may practically benefit by the information they contain.

White biscuit chemical ware, a strong body with a sonorous clear ring when struck, resists acids and intense heat; burning to a cream colored white.

No. 1. Cuttapaukum ball clay, ... 6 parts.
Mount Felspar, ... 3 "
Chingleput Granite, ... 1 "
White Quartz, ... 1 "

materials to be sifted through silk lawn made at Hoonsoor.

No. 2. Brown jasper body.
Arcot yellow Granite, ... 3 parts.
Cuttapaukum ball clay, ... 1 "

finely sifted and ground together.

No. 3. Pale jasper body.
Arcot yellow Granite, ... 2 parts.
(Used as ballast for the railroad.)
Cuttapaukum clay, ... 2 "

This mixture kept its shape better than the last, and did not melt so readily;—when broken it was found to be vitrified all through, like porcelain.

No. 4. Pale drab colored ware.
Arcot Granite, ... 2 parts.
White Quartz, ... 4 "
English ball clay, ... 4 "

The materials finely ground and sifted through Chinese silk lawn. Ware strong and of a good color. The Cuttapaukum and English ball clays are found to be very similar in every respect.

Quartz calcined,... ... ... 3 parts.
Granite, ... 1 "
Flint glass, ... 4 "
Red lead, ... 4 "

No. 5. Large Chemical Evaporating Dishes.
Cuttapaukum ball clay, ... 2 parts.
Chingleput sandy clay ... 5 "

were drab colored and strong, but too sandy.

No. 6. Drab Glazed Ware.

The following mixture was found to be better than the previous one.

Chingleput sandy clay, ... 4 parts.
Cuttapaukum ball clay, ... 2 "
Mount felspar, ... 1 "
The raw glaze consisted of red lead, 2 "
Quartz, ... 1 "

Exposed to a strong heat the glaze ran well.

No. 7. Pink Biscuit Terra-Cotta.
Red Hill clay, ... 1 part.
Cuttapaukum ball clay, ... 1 "

No. 8. Drab Terra-Cotta used for improved Cooking Chatties.
Cuttapaukum ball clay, ... 1 part.
Chingleput sandy clay. ... 1 "

Another good mixture for jam and pickle jars.
Cuttapaukum ball clay, ... 2 parts.
Mount Felspar, ... 1 "

finely ground and sifted Raw glaze for do.
Galena from Kurnool, ... 4 "
Arcot white granite, ... 1 "

Rockingham or reddish brown glaze for do.

Galena, ... 4 parts.
White granite, ... 1 ,,
Bimlipatam manganese, ... 1 ,,

No. 10. Salt glazed stone ware.

Cuttapaukum ball clay, ... 6 parts.
White Quartz, ... 3 ,,
White Granite, ... 3 ,,

Glazed by throwing common salt into the furnace when the wares were at a white heat.

No. 11. Salt glazed ware second quality.

Cuttapaukum clay, ... 2 parts.
Mount Felspar, ... 1 ,,

finely ground and sifted.

Articles glazed, when at a white heat, by throwing refuse salt from the Powder mills into the furnace. Glaze strong and serviceable but rather dirty, salt too impure, and mixed with earth and sand.

No. 12. Common strong earthenware.

Tough Brown Potter's clay, ... 4 parts.
Road dust, ... 2 ,,
Fine sand, ... 1 ,,

materials all washed and sifted together.

Raw glaze for do.

Galena, ... 4 parts.
Quartz, ... 2 ,,

Black glaze for do.

Galena, ... 4 parts.
Quartz, ... 2 ,,
Manganese, ... $1\frac{1}{2}$,,

H. W. RAWLINS, Captain,
Reporter.

LIST OF AWARDS IN CLASS XXV.

District or Country.	Name of Exhibitor.	Manufactures for which Awarded.	Award.
Madras School of Industrial Arts.	Serjeant M. Chesterfield.	For considerable improvement in the manufacture and glazing of Pottery.	2nd class medal.
Burmese Pottery.	Hon. Mr. Walter Elliot.	Strongest and best glazed native Pottery.	2nd class medal.
Vellore.	Mahomed Gouse Shereef.	Best native manufacture in Madras Presidency.	2nd class medal.
Bangalore.	Lieut. Puckle.	Best collection of raw materials.	" Honorable mention."
Raichore.		General improvement in Pottery.	" Honorable mention."
Arcot.	Aroomooga Woodayar.	Do. Do.	" Honorable mention."

CLASS XXVI.

DECORATIVE FURNITURE AND UPHOLSTERY INCLUDING LACQUERED GOODS.

JURY.

Mr. W. Elliot, *Chairman.*
Mr. W. U. Arbuthnot.
Mr. A. Cole.
Lt. Col. Talbot, *Reporter.*

The articles exhibited in this class were not remarkable for their number or variety.

There were no specimens of paper hangings or papier maché.

The largest contributor was Mr. Deschamp, who sent a number of articles carved in ebony by native artists and a few pieces of modern furniture. The native carving was, for the most part, in that style for which Madras has for some years been celebrated. Its general character is that of minute and crowded ornament, so elaborate as almost to preclude freedom of outline or lightness of design. The articles are generally heavy, even clumsy, in form. The artist puts forth his whole strength in covering the surface of the wood with a delicate tracery of flowers, leaves, and fruits. But as all are cut in the same plane, there is a total absence of the freedom and luxuriance of natural foliage, and the effect produced is that of a clipped hedge in the old-fashioned gardens of the last century.

An attempt to get rid of this formality has been made with some success in a "Lotus flower stand," exhibited by Lady Rawlinson; but the leaves which more resemble those of an Arum are too fragile and slender to endure the risks to which they must be exposed by every-day use. At the same time while strength has been sacrificed to secure elegance in one portion, the three serpents entwining the stem in parallel gyrations, impart an air of stiffness to the centre which contrasts unfavourably with the lightness of the lower part of the design. The Mahogany Candelabra by Balny of Paris in the collection of Mr. Deschamp, exhibits a more just appreciation of the description of ornament combining durability with elegance, suitable to ornamental wood-work.

A Davenport in ivory, lined with sandal and satin wood, prepared by Mr. Deschamp under the instructions of the Madras Committee, for the Paris Exhibition, for which it was too late, is a work of more pretension than taste. The ivory was added by the workmen of Vizagapatam, and was covered with superficial tracery of the patterns employed by them on work boxes, desks, &c., which however suitable to articles of small size, has a poor and mean effect when employed as the sole ornament of a large surface in an article of such large dimensions.

Sir Patrick Grant exhibited a punkah carved in Burmah. The Burmese are celebrated for the rich designs in wood with which their monasteries and schools are ornamented. The designs are generally arabesques and are defective in the truthfulness and proportion of the figures introduced which are chiefly deserving of praise for the rich elaborate tracery of the pattern.

A richly carved Chinese bedstead was exhibited by Dr. Porteous which is deserving of mention as a characteristic specimen of Chinese Art.

We give designs of both these objects from photographs taken by Captain Tripe. It was intended to have added one of Lady Rawlinson's flower stand, but it was packed up for transmission to England before Captain T. had time to bring it under his camera.

Some specimens of richly gilt lacquered work were contributed to the exhibition by the Newab of Bauganapilly, viz.

Two lacquered *charpais* or bedsteads.

One lacquered cabinet.

Although far inferior to Chinese laquered ware these were good examples of the Indian style of workmanship. The former is conspicuous for the brilliant black polished ground, covered with delicate gilded tracery, the latter exhibits a profusion of coarse gilding with the pattern in relief set off by colors of the most brilliant tints, vermilion, white and green. The workmanship of the articles as regards their construction is clumsy and rude, and there is a general want of finish perceptible throughout, both in this respect and in surface ornament.

THE JURY RECOMMEND THAT 2D CLASS MEDALS BE AWARDED TO

Lady Rawlinson for a carved Lotus flower stand.

Mr. Deschamp for the number and variety of articles exhibited by him, including a Parisian candelabra by Balny.

The Newab of Banganapilly for specimens of Indian laquered ware.

The following is a detailed list of all the articles submitted to the inspection of the Jury with special remarks appended to each.

No. Mr. J. Deschamps.

7792 Lady's book case, perforated pannels, inside with satin wood.—Good in workmanship.

7793 Pier Glass, with birds, reptiles, fruits, and flowers of India.—Beautifully carved, the proportion appears somewhat faulty.

7794 Flower stand, with fruits and flowers of India.—Carving good, but it would appear that proportion has been lost sight of.

7795 Do. large with do do.—Well executed but poor in design.

7796 Lady's Devonport, with do do.—Good in workmanship and in part also design.

Do. in Ivory.—An elaborate specimen of Indian workmanship made for Paris exhibition. Style of ornament not suitable for the description of articles to which it is applied.

7797 Do. Armoire á glace combining a Lady's wardrobe and a cheval glass.

7798 Arm chair, with figures of children, eagle and flowers.

7799 2 Corner Cabinets.—Pretty and of good workmanship.

7800 Sofa, with fancy rattan seat and back.—Very good and suitable for the Indian climate.

7801 2 Drawing-room Arm Chairs, with fancy rattan seat and back, do do.

7802 2 Hall Chairs, rattan seats.

7803 Carved Bracket " Chimera."—Very good.

7804 Do. Bracket " Rocaille."—Very good.

7805 Dressing Table, Pompadour style, elegant in design, finish, &c.

7806 6 Mountings for Photographs on French and English frames.

2 Pier Tables, with Marble tops, remarkably good in design, taste, and workmanship.

Flower stand, made by Balny (Paris) and exhibited by Deschamp.—Light and elegant in design and manufacture, good.

Lady Rawlinson.

Flower stand, in Rosewood, native manufacture.—Good in workmanship, but the design more suitable for metal than for wood.

Ornamental Punkah, of Burmese carving.

CLASS XXVII.

MANUFACTURES IN MINERAL SUBSTANCES USED FOR BUILDING OR DECORATION, AS IN MARBLE, SLATE, PORPHYRIES, CEMENT, ARTIFICIAL STONES; &c.

JURY.

Colonel Faber, *Chairman.*
Colonel Cotton.
Lt. Colonel Pears, C. B.
Major W. J. Jacob.
Captain Rawlins.
Captain P. O'Connell.
A. Beattie, Esq.
B. McMaster, Esq.
Major Silver, *Reporter.*
Lt. Colonel Atkinson, *Joint Reporter.*

There is a considerable variety of good building stones contributed to the present Exhibition and the display contrasts very favorably with the contributions to the Exhibition of 1855 which were very meagre; many of the Marbles Slates and Porphyries called for by the Jury in their last Report have been forwarded to the present Exhibition, and on being examined they proved to be for the most part highly ornamental when polished.

GRANITES.

Some fine varieties of Syenite Gneiss and Porphyritic granite are exhibited from Hyderabad, these have been slightly polished and are found to be suited for ornamental slabs or pavements. Grey, pale pink, and white syenites of good quality are also contributed by the Bellary Local Committee, and dark red and grey syenites from Cuddapah and Bangalore.

Pink and green porphyries are contributed by Captain Puckle from Seringapatam, Mysore, and from near Chittoor : these are of pleasing colors and take a good polish. Compact chlorite and chlorite slates of good quality are contributed from the Godavery, and from Jowk near Bellary, Chloritic paving and roofing slates from Bangalore and Guntoor, some of these are of excellent quality, and much used by the Natives in building.

GREENSTONES AND WHINSTONES.

There is a great variety of rocks of this kind and many of them are suited for paving purposes, they are plentiful in the Chingleput, North and South Arcot, and Nellore districts, and are much used by the Natives for paving and grinding stones.

SANDSTONES.

Beds of sandstone of considerable extent occur in the Chingleput, North and South Arcot, Nellore, Cuddapah, Bellary, and Guntoor districts, but they are not much used by the Natives on account of the labor and expense of quarrying, and because other stones are usually available in the same districts cropping out of the hills.

Very good compact white free stone is exhibited from Naggery and Nellore. A softer variety resembling the Bath stone, occurs in the Cuddapah collection, and coarse and fine grained sandstones from Guntoor. Yellow and red sand stones occur in the Trichinopoly and South Arcot districts, apparently of different periods of formation. Very compact slaty sandstones are exhibited from the Bellary and Kurnool districts, and these are much used by the Natives for building purposes, on account of the facility with which they are worked. The best qualities are used as whetstones. A very compact granular quartz rock resembling sandstone is exhibited from Naggery, Nellore, and Cuddapah, this resembles the Diamond sandstones of the Hyderabad and Masulipatam districts, it is a hard durable rock fit for building purposes and answers well as a substitute for chert, for paving flint and felspar mills. Some fine slabs from Nellore cut for such purposes are exhibited from the Madras School of Arts.

Colonel Woods exhibits a fine slab of slaty sandstone covered with deudritic manganese from Nagpore.

MARBLES AND LIMESTONES.

There is a large and interesting collection of marbles which, though much inferior to those at the Madras Museum, contains several deserving of special notice. White granular statuary marble of very fine quality is exhibited from Nagpore and Jubbulpore, by the School of Arts, and the Revd. Mr. Hyslop, reports that it is procurable at a cheap rate, but at present the expense of inland carriage is so great that it could not be profitably used in Madras. One specimen resembles the finest Carrara marble, the other is coarser in the grain but white. They are both used for mural tablets and take a good polish. Slabs of 2½ feet by 18 inches broad cost from 2 to 3 Rupees delivered in Nagpore. White granular marble is also exhibited from Tinnevelly, but it is harder and in larger crystals than the true statuary marble, it is slightly blueish in color when polished and shows the crystals on the surface.

White crystalline marble from Ava exhibited by the Madras School of Arts is very similar to the last and has the same defects, being hard and

almost flinty, blueish in color and showing large glistening crystals on the smooth surface. This is the marble of which the Burmese images are carved, and it is equal to the 2nd and 3rd qualities of Italian marble, it is suited for mural tablets in which it could be used as the back slab or support for a finer kind of marble. It is difficult to work but stronger than the fine grained qualities.

Whiteish and grey marbles are exhibited from Datchapilly in the Guntoor District. These are rather silicious and slaty in fracture, they are susceptible of being cut and polished but are only fit for backing slabs or for inferior descriptions of ornamental work.

They might be used for paving but are muddy in color.

Yellow marbles of different tints are exhibited from Guntoor, Cuddapah and Ghooty. They are all more or less Magnesian limestones and compact not granular in fracture. The samples from Datchapilly and Guntoor are very wavy and uneven in surface Those from Cuddapah are dull greyish yellow in color and very hard. The specimens from near Ghooty are the best and most pleasing in color bordering on a lemon yellow, they are susceptible of a good polish.

Green marbles of various shades are contributed from Cuddapah ; one of these is a dark green highly ornamental marble.

Pink, red, and white streaked marbles are also contributed from Cuddapah, they are slaty or tabular in fracture, but dull and muddy in color.

Brown, liver-colored and purple silicious limestones are exhibited by the Guntoor Local Committee, they are hard tabular in fracture, but dull in color.

Grey limestones are contributed from Cuddapah, South Arcot, Kurnool and Sircy, the last is the most pleasing in color and very like a limestone exhibited by Major Maitland from above the Coal measures at Patricroft, near Manchester.

The specimens from Cuddapah are dark grey slaty limestones, containing more or less Sulphuret of Iron.

Those from South Arcot are somewhat similar to the limestone from Patricroft, but on one surface they are covered with numerous fossil baculites.

Good black marble is contributed from Nundial in Kurnool, and is said to be plentiful and very cheap near Tarputre. in the Cuddapah District ; attempts were made to procure a good slab of this for the Exhibition but without success.

A dark grey slaty limestone that becomes nearly black when polished is very abundant near Cuddapah, it is easily worked and can be obtained in slabs of 8 feet by 4 at a moderate price. This is much used as a building and paving stone at Cuddapah.

Yellowish grey Mag nesian limestone are equally plentiful at Kurnool, Ghooty and Datchapilly. At the former locality they are extensively used for building purposes, and many of the samples are fit for lithography, others make good whetstones. These marbles vary considerably in texture and hardness, most of them are too silicious for lithographic uses and resemble the German hone, but soft kinds can be obtained from the same localities. The criteria of a good lithographic stone for most purposes are that it should be easily scratched with a knife, that it should absorb water freely and effervesce uniformly on the surface when washed with weak acid and water. The hard dense flinty varieties that strike fire with steel and hardly effervesce with acid are not good for lithographic purposes, though they answer for hones or burnishing stones for polishing copper or brass.

MEMO.

Several attempts have been made to bring the Datchapilly stone into use at the Government Lithographic Press. No fault is to be found with them as to readiness of receiving and transmitting ink, but hitherto with few exceptions they have soon broken under repeated pressure and 50 impressions is a high number for the Datchapilly stone to yield without fracture.

Planes are then discovered and a want of homogenity in structure.

MOUNTAIN LIMESTONE.

The true Fossiliferous Mountain Limestone of the lower carboneferous strata with silurian fossils and lumps of black carbonaceous matter is found to be plentiful in some parts of this Presidency, but the locality of the quarry has not yet been discovered, though it is probably not far from Madras, as there are numerous and large slabs of it lying about in different places. The following illustrated circulars regarding it have been freely distributed with samples of the Limestone, and it is hoped that some clue may be discovered to the bed ere long. The specimens exhibited from the Madras School of Arts are dense, compact and susceptible of a good polish. It has lately been ascertained that there is a large Tombstone of the same Mountain Limestone with similar fossils at Ootacamund.

Compact grey and white streaked marbles are exhibited by Major Bisset from Juggiapett in the Masulipatam district. These appear to be older than most of the other marbles and to be accompanied by transition slates and granites.

Grey fossiliferous marbles are contributed from Trichinopoly. These vary in color from a yellowish brown to nearly a black. They are composed of shells of the green sand or lower cretacious group and are much used for making table ornaments, rulers and table tops. The colors are rather dull and muddy.

Mr. Deschamps contributes a very fine series of polished marble table tops and pier tables of various sizes and colors. These have been imported from France and have been much used for making ornamental furniture. The best samples are a white slab two varieties of grey and a red and yellowish marble.

The Jury would recommended a Second Class Medal for this series.

LIMES AND CEMENTS.

There is a great variety of limes and other materials of this class suited for cement, but the samples are too small to admit of satisfactory experiments being made with them. Southern India is well supplied with limes of every quality. Nodular lime or kunkur seems to be the most plentiful and to occur in almost every district. Some of the dark grey and blue varieties are hydraulic. A yellowish dense variety from the banks of the Godavery is eminently hydraulic, and some of the Septaria or hollow balls of blue lime from beds of black and blue clay near Madras and Cuttevaulkum are also hydraulic. A small nodular lime common in the beds of dry tanks is a strong lime and slightly hydraulic.

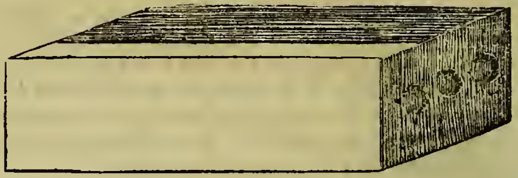
The Hydraulic Lime exhibited by Mr. Carriot of Pondicherry has been tested in different ways, and is found to be of excellent quality. When made up into balls and placed in water about a minute after being mixed, it retains its form and begins to harden acquiring considerable solidity within 24 hours.

One third part of river sand added to it makes it set harder in the same time after immersion. One third part of river sand and one third part of shell-lime added yield a very excellent adhesive lime that cements bricks firmly together and is possessed of hydraulic properties. The sample of this cement that has been exposed by Mr. Carriot for a year to sea water is of very good quality and has acquired a firmness and solidity which prove that it is well adapted for hydraulic engineering purposes. The Jury remark that the cement is very superior to what was exhibited by Mr. Carriot in 1855, and they recommend the award of a Second Class Medal. Most of the Magnesian and Lithographic Limestones are hydraulic, and it has been ascertained by Captain Young at Vellore, that the addition of a little steatite or soap stone (a bisilicate of magnesia) to ordinary limes imparts to them hydraulic properties. The durability of some of the polished chunam of Madras is also owing to its being rubbed with steatite or balapum, which leaves a thin coating of silicate of magnesia on the surface.

MANUFACTURES IN CLAYS.

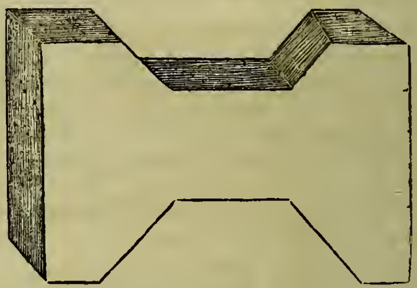
BRICKS.

No. 1. Large building bricks of 16 inches by 8 ins. by 4 ins. made in the School of Industrial Arts of the common black loamy clay of the country as existing in the College compound, they are not sandy but of a tough clay apparently well burnt, but although they may save much chunam in construction, it is not certain whether such thick bricks would be economical in practice on account also of their weight, liability to crack in drying and from the expense of burning them. It is under-



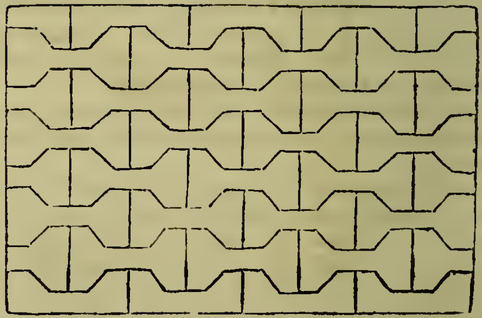
stood that the same kind of brick has been made in the Northern Division with 2 or 3 longitudinal holes in it to facilitate the burning. There are some glazed specimens of the same large bricks for paving from the School of Arts.

No. 2 is a large key brick of similar dimensions but narrow in the middle thus. They were



made also in the College compound to be formed into solid blocks of masonry to let into the sea or into the beds of foundations where water is present being considered preferable to the ordinary, cubes of well bricks and chunam on account of their binding better with four adjoining bricks. These key bricks have not yet been made in large quantities but are submitted to the opinion of the Jury.

No. 3 is another kind of ordinary shaped brick, the material of which is obtained from the



same locality measuring out of the mould 11 inches by 5½ inches by 3 inches. This is for the coping of walls between pillasters and has been used for the Horticultural compound wall and elsewhere; they have been also used in the Railway Works.

No. 4 are common building bricks still thicker than the last, viz. 3½ inches, but it is found to be difficult to fire them thoroughly when so thick unless they are made of very sandy or open materials. These have been supplied to different parties and approved of.

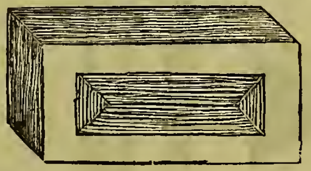
No. 5. Facing Bricks. These are made of a better clay obtained from a depth of 14 to 20 feet. They were dipped into liquid fine clay before burning; a few of them have been glazed on each end and one side; some of the samples are white and others black, the latter from the introduction of manganese into the glaze which is composed as follows.—

Galena from Kurnool............... 2 parts.
Felspar from the Little Mount..... 1 do.
Manganese from Bimlipatam...... $\frac{7}{10}$ do.

No. 6 are specimens of white bricks to be used for the facing of a wall. The peculiarity of these is to save plastering by dipping the moulded brick into white fine clay before burning, as the common chunam plaster is found to corrode in a saline atmosphere like that of Madras.

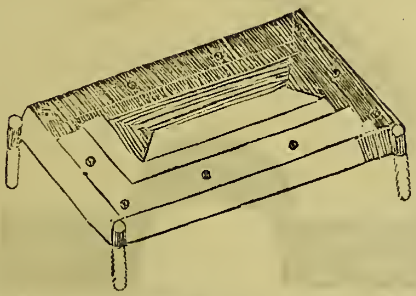
No. 7.' Plain clapped bricks, so termed because they are clapped or struck with beaters before burning to make the edges sharp, and thus save chunam in placing them.

No. 8 are termed kick bricks having a con-



siderable hollow in the side in the form of a reversed hipped roof to hold cement.

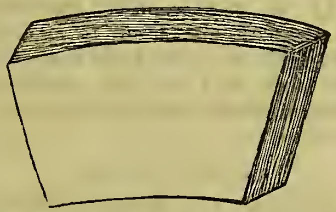
These are made upon a bench with a raised



piece of wood upon which the brick mould fits and upon the centre of which is the kick.

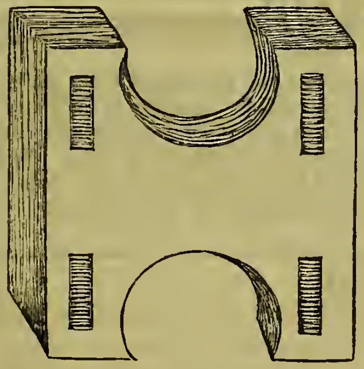
The bricks are shaken out of the mould and removed from the bench upon palettes.

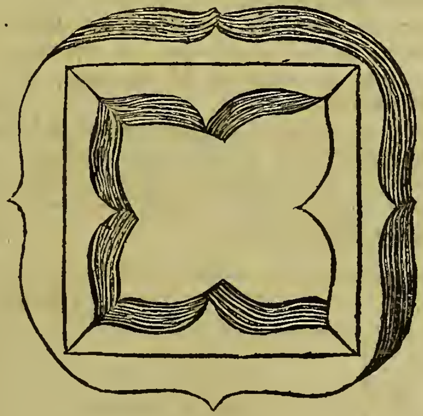
No. 9, circle and well bricks, being the seg-

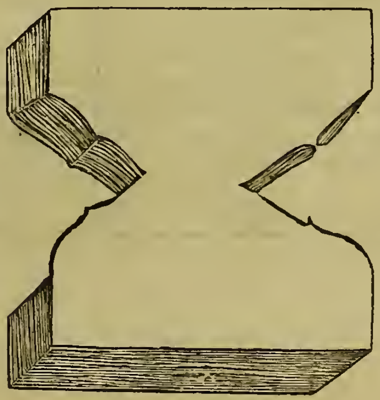


ment of a circle of 10 feet diameter or more. There are various sizes of them which it is needless here to dwell upon.

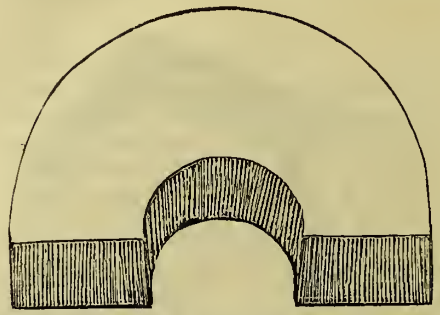
No. 10 is Prince Albert's hollow brick, it is well known that these were used for building his model lodging houses. They may either be used flat as intended for building hollow wells with, or on edge (as they) are $2\frac{1}{2}$ inches thick for trelles work.







No. 11 is a hollow pillar brick the invention



of Lieutenant Puckle, the hollow being 4 inches, out of the 12 inches diameter.

These have been found serviceable for building light pillars, but the hole in the centre appears to be too large.

No. 12 is another brick somewhat larger than the standard size made in Madras by one Casoo Moodelly. It seems a fair kind of brick and has been much nsed lately in new buildings at the Arsenal at Madras and the Penitentiary.

BUILDING BRICKS.

No. 13 made by the Railway Contractors measuring 9 inches by $4\frac{1}{2}$ by $2\frac{1}{4}$. These are of different qualities ; the sample marked I I I I is of good Clay and well burnt, those marked I I I look too sandy to be recommended for adoption.

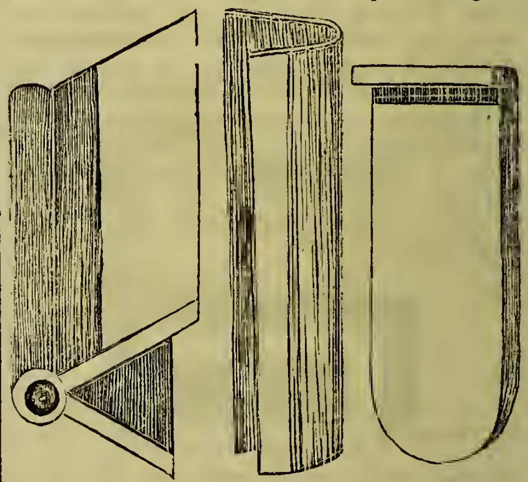
No. 14 are of different sorts of fire bricks from the School of Arts, for Iron and Coke furnaces, Patter's ovens and Bake houses.

No. 15 are samples of fire bricks from the Gun Carriage Factory, in the unburnt state : on exposing these to heat they are fouud to be too sandy in texture to be durable.

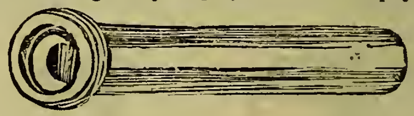
The paving tiles from Chingleput seem to be of a superior quality, but the size and thickness being in excess of what is usual for Natives to burn, it would seem almost doubtful whether they could be economically manufactured.

Among the building materials deserving of notice are some perforated verandah and cornice tiles, from the Madras School of Arts, of the accompanying forms ; also some long Italian roofing tiles, 12 inches by 5, plain and glazed : these have the advantage of covering a large space and affording a comparatively light roof; the original samples were furnished by the late Captain Best.

Pantiles, coping, and ridge tiles, garden and draining tiles, of the following shapes, are also exhibited from the School of Arts, and plain and glaz-



ed earthernware and stoneware water pipes with joint elbows and sockets ; these water pipes have been advantageously employed in the Sepoy lines



at Perambore and the glazed water pipes are being used in the officers' quarters in the Fort.

Encaustic paving Tiles of several patterns are contributed by the School of Arts. The designs of some of these are good, but the colors are dull and the manufacture is far from being perfect.

1st CLASS MEDAL.			
Pro. No.	Catal. No.	Name of Exhibitor.	Object rewarded.
		Dr. Hunter, ...	For improved Building material.

2ND CLASS MEDAL.

Pro. No.	Catal. No.	Name of Exhibitor.	Object rewarded.
		Mr. Deschamp, ...	For Series of Marbles.
		Mr. Newill, Guntoor	For Marbles.
		Mr. Murray, Cuddapah.	Do.
		Mr. Carriot, Pondicherry.	For Hydraulic Lime.
		Lieut. James Puckle, Executive Engr. Department P. W. Mysore.... ...	For the discovery of good roofing slates and whet slates near Bangalore, and for the display of ornamental Porphyries and Granites from the vicinity of Seringapatam and Mysore, by the same Contributor.

A. C. SILVER, *Major*,
Reporter Class XXVII.

NOTES OF THE EFFORTS MADE IN THE MADRAS PRESIDENCY TO OBTAIN HYDRAULIC CEMENT.

In no country in the world is it of greater importance that an ample supply of Hydraulic cement should be procurable than in India. The grand scale upon which Hydraulic works are formed, and the dependence of the great bulk of the population upon their stability and efficiency, not for prosperity alone, but the very means of existence, and their influence on the condition of the revenue of the state, all prove its inestimable value.

Accordingly the attention of the Madras Government has been frequently given to the subject, and the practical knowledge of their Engineer Officers has been made available to work out the problem, by experiments and trials extending over a considerable period.

Those experiments have been attended with varying results, occasional failures alternating with successess, when the conditions were apparently the same. Guided however by experience to a better choice of materials, and due proportions of admixture, a degree of certainty has been attained, which bids fair to place it in the power of every executive officer to provide for himself an independent supply for all his requirements.

The late Dr. Macleod introduced magnesite as a base for cement in 1826, but the results of numerous trials and experiments were so conflicting, that it was impossible to form a definite opinion as to its merits. Those early experiments were conducted by that gentleman in conjunction with Capt. Sim, the Supg. Engineer Presidency Division.

Lieut. Col. Monteith continued the experiments in 1834 with the same results, upon a parcel of 60 Tons of Magnesite brought from Salem, at no less a cost than 80 Rs. per Ton, being 30 Rs. more than the market price of Parker's patented cement.

The Local Government and the Court of Directors continued to press the question on the attention of the Military Board, and in 1847-48 further investigation was entered into under the direction of Major G. N. Underwood, who tested its efficiency as a competing mortar with the chunam in common use.

In a report to the Military Board dated 28th

October 1847, that Officer says, "In certain localities the Magnesite has stood very well and I am not able to account for the diversity of effect, since in those places where it originally failed the same care was exercised as in the places where it has succeeded, the aspects and conditions being nearly similar."

The nature of the experiments may be gathered from the directions of the Military Board, dated 5th November of the same year, in their letter to the Governor in Council. "We have instructed Major Underwood to endeavour to ascertain the exact proportion of ingredients respectively, and make further trials in dry buildings, and in such as are exposed to wet, fresh or salt, and we hope the result may enable us to submit a more satisfactory report than we are at present able to do."

The tests of those experiments may be worth recording for future guidance or warning, they are contained in a memorandum, enclosed in letter to the Military Board under date 26th September 1848, in which Col. Underwood repeats his former opinion regarding the inapplicability of those cements for the intended purposes, they are as follows:

1. "Medical Stores—East face. Three samples of plaster were applied in March last, viz :—

10	Square feet,	Magnesite	1,	Sand	1½
28	do.	do.	1	do.	2
84	do.	do.	1	do.	1

The above plaster was laid on in two coats; the cement for the second coat was ground very fine, and well rubbed on the wall with Bullapum. The experiments made with equal parts of magnesite and sand, appear harder and in better preservation than the others, but even it has begun to scale off in some places, having been laid on over the old masonry.

2. West office of same building opposite the Superintending Engineer's Office.

Two specimens were laid on here at the same time as the above in the following manner.

44	Square feet,	Magnesite	1,	Sand	1¾.
96	do.	do.	1	do.	1¼.

The latter sample is in good preservation. The cement in this case was mixed with jaggery, and was applied over a first coat of coarse chunam.

3. Gun shed.

In my last a small quantity of this cement was applied to the new masonry of the Gun shed.

10	Square feet,	Magnesite	1,	Sand	1¼.
18	do.	do.	1,	do.	1.

This was applied in two thin coats and it is still quite firm, but there has not elapsed a sufficient time since its application, to judge correctly of its qualities."

These quantities are of measure, not weight.

Further information being called for from the Board of Revenue, the then Secretary Captain J. H. Bell responding to the Secretary of Government, forwards under date the 11th June 1849, the opinions of the most experienced Engineer Officers whose attention had been given to the subject.

Amongst others those of Major Cotton and Capt. Lawford, the latter of whom stated that in the course of experiments made by him in the formation of cement from Magnesite, he found, that mixed with sand alone it was of little or no use; but mixed with Laterite it formed an excellent cement. The reports of other officers agreed also in this particular. The former objections to its use on the score of expence and uncertainty of effect were still however unsurmounted.

Major Cotton's experiments seem to have been of a somewhat elaborate character as Rs. 500 were expended in their prosecution; and it appears they succeeded materially in deciding the point at issue, as the Military Board reviewing those efforts in their report to Government of 11th June 1849 state, "it is certain that cements more or less Hydraulic may be made everywhere if wanted, and that all the Kunkurs from which lime is principally prepared in the interior, will without admixture of other materials besides sand, set under water after a lapse of time."

At the same time the Government of Bombay was requested to have experiments initiated in that Presidency. The application was disposed of as unnecessary; on the ground of their being in possession of a much better and cheaper Hydraulic Cement, which could be made in ample quantities for their requirements, and was easily procurable in any part of the Bombay Presidency.

Occasional investigations into the subject continued, and Col. Underwood in March and April 1850, reported to nearly the same effect as before; additional experience inducing the opinion that this magnesite cement was likely to prove valuable for floorings as a substitute for common chunam. This view however has not been substantiated.

A good share of the difficulty experienced, seems to have been ascribed to the opposition of the Maistries and native workmen, who as usual disliked innovations on their ancient habits and customs, such prejudices were probably more marked in their characteristics at that time, than at present, and there seems to be some ground for believing that a change for the better is coming over the national mind, contact with truer ideas; increase of European superintendence with the introduction of European modes of work; creation of large establishments rendered necessary by the introduction of railways; and improvements in the large Government establishments, are evidently telling upon native habits, and lending a helping hand in the upward and onward progress of this important branch of the human race.

Little more was done in the matter till 1854, when Colonel C. E. Faber becoming Chief Engineer, commenced anew the agitation of the question with a keen eye to practical results, a memorandum drawn up by that gentlemen dated 19th October 1854, contains a comprehensive review of the efforts

previously made, combined with the communicated opinions of the most eminent officers in the Department of Public Works on the subject, and the conclusion Colonel Faber arrives at so far as magnesite is concerned is, "I do not see any sufficient cause for adopting magnesite as a base of future hydraulic cements, and think that good compounds may be made of unquestionable efficacy by a much more economical process."

The opinions of the Officers above referred to strengthen this conclusion; and the pith of the whole matter is arrived at in an extract from the letter of Capt. Boileau Chief Engineer's Memo., page 15,—where that gentleman states "it seems to have been settled by Monsieur Vicat, that if any kind of Limestone whatever be slaked, mixed with pure clay, then balled and baked, it will produce a good hydraulic cement."

Magnesite and sand were now given up as the ingredients, and lime and alumina or pure clay adopted.

The advantage to be derived by organizing an establishment for the purpose of manufacturing hydraulic cement was then mooted, discussed, and eventually submitted for the sanction of Government, both by the Military Board and Board of Revenue, in October and December, 1854, respectively.

Government, on the 12th March, 1855, acquiesced in the proposal, and Captain Applegath, 33d Regt. N. I., was appointed Superintendent of the depot, which was to be constructed near to Cochrane's Canal Basin.

That officer accordingly set to work, and by the month of July communicated his belief, that a hydraulic cement could not be made from shell lime, and the blue clay found in the plains along the Coast of Madras, in the bed of the Cooum, the Fort Ditch, and Cochrane's Canal. But he had succeeded in his object by using a Kunkur or Nodulous Limestone, found in the village of Coopoor, Chingleput, and clay.

The cement was examined, and its quality favourably reported upon, by a committee appointed for the purpose.

After an examination into the circumstances and the cost at which the cement could be supplied, the Chief Engineer, under date the 12th October, declares the whole trial a failure, and solicits Government to sanction his directing Capt. Applegath to close his accounts, and deliver over charge of his office to Captains Hitchins or Rawlins.

The cost of manufacture may here be noted, namely, Rs. 1-1-4 per parah, as per Capt. Applegath's letter to Chief Engineer, dated 24th September, 1855.

In the course of discussions consequent on these investigations, it incidentally came out, that in 1828 Colonel Garrard not only succeeded in making a good cement from the blue clay and shell, but also published a pamphlet on the subject, which latter, with all office records of his proceedings bearing thereupon, appear to have been entirely lost.

While Captain Applegath's attempts were progressing and resulting in unfortunate failure, another officer, Lieut. Morgan, attached to the Eastern Coast Canal, was making and using successfully a hydraulic cement, in the construction of a lock at Shedian Coopum on Cochrane's Canal, 6 miles North of Madras.

The ingredients used were the identical blue clay and shell lime referred to.

On the failure of the other, this officer was called upon for a report of his process, and the data given are so interesting and practical that it may be worth while to record them here.

It will be seen that it is identical with that of Capt. Man, detailed in the memorandum of the Chief Engineer above alluded to. The difference in quantities of the respective ingredients used by the two officers being owing doubtless to the difference in the qualities of the limes and clays, and strengthening the conclusion, that these ingredients used in proper proportions, and properly manipulated, will always give a good hydraulic cement.

Lieut. Morgan, coming to the point at once, says :—

"Para. 1st. Shells obtained from beds in the Pulicat lake, and blue clay.

2d. To 7 parahs of shell lime, add 5 parahs of blue clay, mix well in a mill, make into balls not exceeding 2½ inches in diameter, bake in an oven or burn in an open kiln, with billets of wood and cowdung cakes, (when burnt the balls are of a light yellow colour;) the balls are then reduced to an impalpable powder, and the cement is applied either pure or mixed with an equal quantity of fine brick dust; the pure cement is chiefly used for pointing and stopping powerful springs.

3d. If the cement be applied under water it will require 24 hours to become indurated; if applied dry and the water be let on in half an hour about 8 or 10 hours will be the time. If the cement be mixed with equal quantities of brick dust, and applied under water, it will require 48 hours to become well indurated; but if applied dry and the water let on in half an hour, from 12 to 24 hours will be the time required for induration.

4th. The cohesion of the cement is superior to that of common mortar, the adhesion (if at the time the bricks have been saturated with water) is equal to that of common mortar, but every thing depends on the freshness of the cement, and its being reduced to an impalpable powder. It is hardly necessary to be observed that sand should on no account be mixed with the cement.

Lieutenant Morgan then enters minutely into the items of cost; but it is unnecessary to give the details here, as they will differ in different localities; indeed too much importance need not be attached to the calculation, as the Supt., Lieut. Chambers, points out omissions in the charges. It may be sufficient to state generally that Lieut.

Morgan gives the cost at $2\frac{1}{2}$ annas per parah of 4,000 cubic inches, which Lieut. Chambers increases to 4 annas ; even that will be allowed to be a very small figure for such a valuable article.

The value of such a report consists in the precision with which quantities of ingredients, method of manipulation, time of induration, and such like facts are given.

Capt. Applegath's data are not recorded, which is much to be regretted. There is as much experience to be gained at times from failures as successes. They might at least prevent the same ground being needlessly retrodden, to the loss of both time and money.

With Lieut. Morgan's system of manufacture may be contrasted that of Capt. Man, Executive Engineer, Singapore, which is as follows :—

" Mix 5 measures of slaked lime, with 2 of blue clay fresh from the bed. These are thrown into an ordinary mortar trough : the clay should be cut up into small pieces by a mamoty, and roughly mixed with the lime, and the whole should then be punned till no trace of the lime can be observed. I always pass my composition through a Pug-mill, as the incorporation is far more complete by this machine, which is very easily constructed. The mixture must then be divided into cubes or balls of about $2\frac{1}{2}$ inches diameter, to prepare them for the kiln. General Sir C. Pasley allows the balls sufficient time to dry, so that they will not adhere to each other; but I have always omitted this precaution, as exposure to the air weakens and eventually ruins the raw cement, and every inconvenience is avoided by a little extra care in packing the kiln and using a gentle fire at the commencement till the whole of the moisture has been driven off. The colour of the smoke forms the best criterion for the regulation of the fire. About 8 or 9 hours' strong heat will be sufficient for the due calcination of the cement. Should it not be required for immediate use, it had better be retained in its then state, as there is this remarkable difference between cement and quicklime, which latter rapidly absorbs moisture from the air and falls into a powder, while the former altogether resists the action of water. As soon however as it has been reduced to powder, it becomes exceedingly susceptible of atmospheric influence. I have found the common Chinese baker's mill and sifting apparatus exceedingly well adapted for the subsequent operations, which consist merely in reducing the balls or cubes to powder, and sifting it to a perfectly impalpable state. Care must be taken not to mix more at one time than is sufficient for the supply of the masons ; as if not at once applied, it speedily begins to set and then becomes unfit for use.

For stuccoes I have always used sifted coarse sand 1 to 1, and this appears to answer better than either fine or mixed sand.

I constructed a roof with this cement 4 years ago, which has stood perfectly, it was formed of 3 courses of tiles about 5 inches square, $\frac{1}{2}$ inch thick, held together with pure cement. As the cement stucco would not have adhered to the cement joints I interposed a stratum of mortar composed of 1 lime to 2 parts of brick dust, over this I put a coating of about $\frac{3}{4}$ inch of 1 cement and 1 coarse sand.

The roof had a low pitch, but might have been made much flatter had it suited the elevation of the building."

Captain Man has to the above appended the following useful rules :—

1st. The powder must be kept perfectly dry.

2d. It must also be in a perfectly impalpable state.

3d. In preparing it for use add no more water than is sufficient to bring it to the consistency of fresh putty. It must then be worked up into a thoroughly homogeneous mass.

Until the workmen are expert in the manipulation of the compound, it had better be prepared in small quantities ; I would suggest a seer as affording a suitable measure for the supply (in pointing) of 2 or even 3 masons.

As soon as the cement has so far set as not to adhere to the agate, it should be carefully polished.

I will now succinctly point out the inconveniences that may be expected to arise from a neglect of these injunctions. Should the cement be exposed to the air or damp, it will speedily become perfectly inert, and will require to be recalcined before it regains its energy.

The best cements will fail if not reduced to a perfectly impalpable powder.

Cement powder on being converted into a hydrate must either be used immediately or thrown away as effete ; it will not bear remixing.

Should the final polishing be neglected, the whole surface of the cement will, in a few days, be found covered with innumerable cracks, and though the cement may have set in the most perfect manner, and its adhesive qualities remain uninjured, its cohesive properties will be entirely destroyed.

I will only add one further general remark, admitting however of no exception, that all cements are weakened by the addition of sand ; it may however be used when required as stucco, in the proportion of 1 to 1, and coarse sand gives a better result than fine."

Considering that these definite and clear directions were published before the trials and experiments of Capt. Applegath and Lieut. Morgan, it seems surprising that difficulty, much more that failure, should have occurred.

These extracts may serve as a trustworthy basis on hydraulic cement manufacture, as facts which may be relied upon and as safe guides to success.

On the 6th November, 1855, Captain Applegath closed his accounts, and gave over charge of the hydraulic works to Captain Hitchins, who subsequently restricted himself to making cement from

shell lime and blue clay; apparently following in the wake of Captain Man and Lieut. Morgan, and with a like result.

In reporting the result of his operations in a memorandum dated March 4th, 1856, Captain Hitchins shows that a superior cement to that of Parker's could be produced at one sixth of the cost, the price of the latter being Rs. 2-15-1 per parah, while that made by himself on the spot cost under 8 annas. And he earnestly urges the advantage of constructing cement works, for the alterations and repairs of Fort St. George, in which he is warmly seconded by the Chief Engineer; who points out that it would effect a saving of about 2½ lacs of Rs. on this work alone.

The element of carriage cost, as shown by Captain Hitchins, renders it highly improbable that it will ever become advisable to create large works to manufacture and supply cement to any great distance inland, as, at the very moderate computation of one pie per parah per mile of cart hire, the prime cost would be more than doubled at a distance of 100 miles.

From the attention which has been given to the subject, the preparation of hydraulic cements has now been reduced to a matter of certainty both in quality and cost.

R. KENNEDY,
Executive Engineer.

OFFICE, ADYAR,
5*th May*, 1858,

CLASS XXVIII.

MANUFACTURES FROM ANIMAL AND VEGETABLE SUBSTANCES NOT BEING WOVEN OR FELTED OR INCLUDED IN OTHER SECTIONS.

Jury.

The Honorable Sir H. C. Montgomery, Bart.
The Honorable Walter Elliot, Esq.
W. E. Underwood, Esq.
Lieutenant Colonel G. Balfour, c.b.
H. F. C. Cleghorn, Esq., m.d.
Colonel F. A. Reid, c.b.
A. Hunter, Esq., m.d.
Lieutenant Colonel T. T. Pears, c.b.
J. D. Sim, Esq.
Colonel Æ. Shirreff.
Major J. Maitland.
Lieutenant Colonel W. H. Budd.
Lieutenant Colonel A. McCally.
Colonel P. Hamond, *Reporter.*
Major G. Simpson.
Captain W. C. Baker.
Captain C. Biden.
W. E. Cochrane, Esq.
J. Binny Key, Esq.
W. Arbuthnot, Esq.
J. L. Lushington, Esq.
J. T. Maclagan, Esq.
A. T. Jaffrey, Esq.
E. Beaumont, Esq.
Lieutenant Mitchell, *Reporter.*
T. Peachey, Esq, *Reporter.*
Dr. W. Elynn, g m.m.c.
W. B. Wright, Esq.
G. Williams, Esq.
N. C. Mooroogasen Moodeliar.
C. V. Conniah Chettiar.
C. Runganada Shastree.
Sub-Conduetor Briggs, *Reporter.*
W. B. Liddell, Esq.
Captain Hawkes.

The articles in this class are necessarily of a very miscellaneous character. As however they are many of them peculiar to India, exhibiting not only the materials indigenous to the country, but also the skill and workmanship of the Natives, they come immediately within the purposes of the Exhibition.

Many of them are of little intrinsic worth, but yet are valuable inasmuch as they shew the large amount of labour which the Natives are willing to bestow on them, and point at the vast benefit which might result were the same care and patience directed to works of a more useful and more valuable description.

There is a large show of statuettes, groups, and models in pith, which, considering the material, are on the whole very creditable. Some of the figures are particularly well executed in parts, but it is to be regretted that the same care was not bestowed throughout, the feet and hands being mostly very rudely cut, no doubt to some extent owing to the slightness of the material, which however does not present an insurmountable difficulty, as is proved by the superior finish of the extremities of several of the figures. The models of Buildings, Pagodas, &c., are, generally speaking, not so creditable as the figures.

The Jury commends highly—

No. 5117. A figure of the Rajah of Tanjore in full dress, and

No. 6845. A group of three Native gentlemen.

The Jury also commends—

No. 5129. A model of a State Palankeen, very well carved, and is of opinion that there can be no question as to the comparative merits of figures and models, and the difficulty of representing, in such a material, animate and inanimate objects.

There are a great many articles of ordinary and ornamental use, manufactured out of a variety of substances, viz., tortoiseshell, ivory, elk and buffalo horn, porcupine quill, grass, sandal, rose, palmyra, satin, and ebony woods; in many of them several of the materials are combined, and some of them are inlaid, chased, and etched, with a very considerable amount of skill and taste. It is, however, to be regretted that many of them are spoiled by being roughly and carelessly put together, the exquisite carving of some of the sandal wood boxes, exhibited by the Right Honorable Lord Harris, is disfigured by the coarse brads and sprigs, most unnecessarily driven through the mouldings, and by the very bad mitreing. The four writing-desks, Nos. 8809, 8810, 8814, and 8815, are all mutilated by the addition of a button catch, which from

the form of the article is quite unnecessary, and has occasioned in the fixing the disfigurement of the moulding in the most prominent part. The locks and hinges are also, for the most part, of a very trumpery description. The articles comprise Writing Desks, tea caddies, work, knitting, cotton, jewel, card, envelope, glove, and Empty Boxes, work, worsted, fancy, flower, and other baskets, Ink and Flower Stands, cribbage and backgammon boards, Letter Files, Paper Weights, Folders, Rulers, cigar Cases, &c., &c., &c.

The Jury commends, highly—

A large and a small sandal wood box, the small one especially for its very beautiful carving, and two card cases. The property of the Right Honorable Lord Harris.

No. 8801. A folding backgammon board, enclosing three ivory boxes, containing chess and draughtsmen and dice boxes. The squares of ivory and tortoiseshell; the board and boxes, of ivory, buffalo horn, sandal and rose-wood; a very handsome, and remarkably well-finished article, made by Sedashoo of Vizagapatam, the largest exhibitor of articles of this description, which are nearly all equally good.

A small sandal wood box, and a paper weight, both carved out of the solid, exhibited by W. E. Underwood, Esq.

The Jury also commends—

A flower stand, made of elk horn particularly well put together.

A very curious collection of carvings in ivory and horn, is exhibited by his Highness the Rajah of Travancore. The animals, birds, flowers, and insects are very creditable, although not equal to European work of the same description. The fruits and vegetables are very good, and a snake and four ivory paper folders are beautifully carved and would do credit to any artist; Four groups of figures in this collection are also very good.

The Jury commends, highly—

9560. A carved ivory snake.

3561-4. Four carved ivory paper folders.

The Jury also commends:

3591. Ants and flies.

Articles carved and turned are plentifully exhibited, there are toys, cups, goblets, perfume bottles, jumboos, goojahs, boxes, rulers, sticks, flutes, bangles, &c, in ivory, buffalo horn, tortoiseshell, and various woods, plain, colored, and lacquered, some of them very good imitations of tortoiseshell. The peculiarity appears to be, that they are mostly turned out of the solid, a very expensive method of working, as far as ivory is concerned, there can however be no doubt of its very great superiority, over the European system, in point of strength :—one ivory bottle, rendered elastic by its excessive thinness, is curious. 2326 is a very beautifully carved cocoanut-shell, these articles are from Ceylon; 3487 is a well carved, silver-mounted, cocoanut-shell from Travancore. 5994, a set of lacquered ornaments of Scinde manufacture, are very beautifully colored. 4968, a set 25 pieces of geometrical solids for the use of schools ; these are priced " not less than 30 Rupees," which the Jury considers too dear to admit of their general introduction into schools. Some of the figures, particuarly a double cone, are not true, and they might all be made on a much larger scale with advantage. 4177. Six specimens of ornamental turning are remarkably well executed. 9091 an ivory vase, is the best piece of turning in the Exhibition. 4987 a set of carved ivory chessmen, on concentrically turned bases, are tolerably well executed, so far as the turning is concerned, and cheap at the price. There is also a statuette in ivory of Hercules, after a copy in Serpentine, this is very beautifully got up.

The Jury commends, highly—

9091. Mr. Rohdes turned ivory vase.

The Jury also commends:

4177. Mr. Cotton's specimens of ornamental turning, and

2326. A carved cocoanut shell from Ceylon.

In Caoutchouc there is nothing, and in gutta-percha but few specimens. Nos. 7652 and 7841 are indifferent articles of English manufacture.Nos.7653-4 are a fire bucket and pitcher made at Singapore.

There are boxes and baskets in bamboo, grass rattan, &c. of a variety of shapes, and sizes.

2814-5. Two covered baskets, are well made and cheap.

Hats and bonnets are exhibited, of which the workmanship cannot compete successfully with the well known Manilla article.

Among the miscellaneous articles there are, 6177 a curious pair of rosewood clogs, in which a flower is made to open and shut by a spring under the heel. 5130, a serpent of horsehair, 9249-9251, platters made of cloves, as beads are strung in England, and 4710, goblet and platter of paddy made in the same manner. 1096, a vasaputum or reading stand, framed and hinged out of the solid, which opens in the centre as trestles do; a curious piece of carpentry.

The Jury recommends that the following prizes be awarded ;—

2nd Class Medal.

To Sedashoo of Vizagapatam, for 8801 a folding backgammon board, and the other articles exhibited by him.

To the maker of a small carved sandal wood box, and a paper weight, carved out of the solid, made in Madras, exhibited by W. E. Underwood, Esq.

To the carver of No. 5117. A pith figure of the Rajah of Tanjore, and, if not the same person.

To the carver of No. 6845. A pith group of three native gentlemen.

2nd Class Medal.

To the carver of Nos. 3560 @ 3564. A snake, and four paper cutters carved in ivory.

The Jury has not deemed it necessary, advisable, or in consonance with the purposes for which the Exhibition was established, to award prizes to the exhibitors of the other articles specially noticed in the foregoing report, although there can be no doubt of their excellence.

CLASS XXIX.

MISCELLANEOUS MANUFACTURES AND SMALL WARES.

JURY.

Major General P. E. CRAIGIE, C. B.
A. H. MURRAY, Esq.
R. W. NORFOR, Esq., *Reporter.*
E. LECOT, Esq.
W. H. CRAKE, Esq.
SIRDAR JUNG BAHADOOR.
C. V. CUNNIAH CHETTIAR.
B. CARDOZO, Esq.
Lieutenant MITCHELL,
G. B. SHAW, Esq.
Dr. J. W. MAYER, M. D.
FINDLAY ANDERSON, Esq.

The collection of Vizagapatam ware, in ivory and elk horn, shows an improvement so great in shape and finish of the several articles as to make it evident that European taste and judgment has come largely in aid of the workman's skill. The old and clumsy shapes, though previously much improved upon, seem to be fast giving way, and a taste has, beyond doubt, been introduced among the workmen, which will exclude effectually the old and faulty style. There are some articles of quill and horn work in the past style of Vizag., and only moderately good in their way. Ivory chessmen exhibited are not of sufficient merit to require particular notice.

Travancore exhibits some ivory carvings of animals which are curious and good. A snake is very good, and some flowers and insects in ivory and horn show much skill and deserve every praise.

An ivory figure of Hercules, exhibited by General Cullen made by a native, is probably well copied, and exemplifies the capacity of the Travancore workmen under good guidance; the symmetry, however, of the model is questionable.

Some carved sandal wood boxes, exhibited by Lord Harris, are very fine specimens both in pattern and execution.

An elastic ivory bottle from Ceylon is very curious, and a Ceylon sandal wood box is good.

In ivory and wood turnings, an ivory cup, executed by Mr. J. Rohde, C. S., is the most perfect specimen of turning in the Exhibition.

The pith figures and models brought forward are of the usual class, from Trichinopoly, but all are carefully and beautifully made.

Tanjore has sent in one specimen which in delicacy of workmanship and general effect surpasses all others, and is entitled to great praise, viz. a marriage palankeen with all its ornaments of wreaths and carvings.

The lacquered ware exhibited from Kurnool is very good; much improvement might be effected in these productions, had the workmen, like those of Vizag., the advantage of European taste to aid them in their designs. The articles are very cheap, and the ware should come into great request for many articles of domestic use.

The English lacquered ware exhibited is ordinary, and, if shown as specimens for imitation, or as marking the progress of the art, they by no means meet the object.

A few small specimens of lacquer from Scinde are very good in quality.

Some leather lacquered table mats from Cuddapah are very good, but they require to be thickened and finished at the back to make them useful.

Mysore, Masulipatam, and Hyderabad exhibit some good toys, but without novelty.

Tinnevelly models of fruit and vegetables are very inferior. Bangalore also sends some poor imitations of fruit, but Poodoocottah sends some creditable wax vegetables.

Some fans are shown from various quarters, but none of merit.

Mats are shown from Vizagapatam and Tanjore, but a Kandian mat, No. 2321, is by far the prettiest specimen exhibited.

Some hats and a bonnet, with sundry baskets, are exhibited by the Rajah of Vizianagram. The baskets are good and sufficiently pretty, but the intention in exhibiting the bonnet is difficult to determine.

Cuddapah, Guntoor, and Malabar exhibit specimens of sealing wax of the usual good quality produced in these districts; when wax is used for letters, these waxes can be recommended as harder and superior to the home made.

South Berar exhibits a very inferior wax and some very bad wax candles.

Malabar exhibits some good candles, but as they are not moulded they cannot compete with the highly-finished composition candles of English make, though but little care seems needed to render

the Malabar candles very saleable articles, and give them something of their old standing in the Indian markets.

Specimens of bead work are exhibited of European and Native make of various degrees of merit. One teapoy cover in beads and crotchet by Miss Locher is the best of all and is very good.

A set of geometrical solids, from the Gun Carriage Manufactory, deserves notice.

A large collection of papier mache, meats and fruit made by Mr. Kormareck.

A Spaniel in worsted work, exhibited by Mrs. Kormareck, is very well worked.

Some gutta percha articles from England are good. Some from Singapore are of useful kinds, but want shape and finish. It is to be regretted that attention is not given at Madras to this branch of manufacture.

A collection of sticks, exhibited by E. Balfour, Esq., is very good ; the object is to show that for a small expenditure, a collection may be made, without trouble, of any or of all kinds, and this object is fully answered.

Some sections of elephant's teeth, exhibited by Mr. Rohde, are remarkable for their size.

An assortment of shoes and slippers from Messrs. Crowe, do great credit to their makers ; a variety of native slippers, from various quarters, have nothing remarkable about them.

An assortment of uttas from Aurungabad, can only be called middling ; another from Madras is very inferior.

Some paddy and clove trays from Cuddapah and from Tanjore are very good.

A leather desk from Condapillay promises much from that quarter in this description of goods.

A complete set of figures from Trichinopoly are good.

A bouquet of paper flowers, most tastefully mounted, merits notice, exhibited by Mrs. Nicholls.

JURY AWARDS RECOMMENDED.

8801 to 8839 Sedashia, Vizagapatam ivory and horn ware, 1st Class Medal.

3682 to 3981 Pith work, Veerasawmy Naick, 2nd Class Medal.

5129 Ditto T. Kistnah Row, Exhibitor, 2nd Class Medal, recommended for maker.

R. W. NORFOR,
Reporter.

CLASS XXX.

FINE ARTS, INCLUDING ALSO COINS, BOOKS, ETC.

JURY.

The Right Honorable Lord HARRIS.
M. GALLOIS MONTBRUN.
His Excellency General Sir P. GRANT, K. C. B.
The Honorable WALTER ELLIOT, Esq., *Reporter.*
R. O. CAMPBELL, Esq.
W. E. UNDERWOOD, Esq.
G. ELLIS, Esq., *Reporter.*
FINDLAY ANDERSON, Esq.
S. D. BIRCH, Esq.
EDWARD BALFOUR, Esq.
H. W. PORTEOUS, Esq.
Captain J. W. HAY.
Colonel HAINES.
J. P. NASH, Esq., M. D.
A. COLE, Esq., *Reporter.*
J. W. BREEKS, Esq.
R. H. POWYS, Esq.
J. G. GARRETT, Esq.

SUB-JURY..

PAINTINGS, DRAWINGS, PHOTOGRAPHS AND ENGRAVINGS.

FINDLAY ANDERSON, Esq.
S. D. BIRCH, Esq.
J. W. BREEKS, Esq.
Captain J. W. HAY.
A. COLE, Esq., *Reporter.*

The Collection of Pictures exhibited at the Banqueting Hall may be divided into two classes.

Firstly. Those executed by the hand, viz. paintings in oil and water colours; drawings, and engravings.

Secondly. Those executed with the aid of the camera, namely, the various descriptions of photographs, and daguereotypes.

This second class, containing contributions from the three Presidencies, and from Europe, and embracing portraits, groups and animals from life, landscapes, buildings, architectural details, microscopic objects, and copies of engravings, is so superior to the first, both in number and merit, that it is entitled to the first consideration.

Although having in a great measure the same objects, the arts of painting and photography are diametrically opposed to each other, the very qualifications necessary in a good photographer are widely different from those required to constitute a good Artist; whereas the former requires good taste and judgment, combined with skilful and careful manipulation, depending for success on the quality of his apparatus and materials; the latter must possess talent, knowledge, and conception, combined with such skill in using, and power over the implements and materials he employs as can only be attained by long and laborious study and practice.

The works executed by their means are entirely dissimilar, the very points which would constitute the chief merits in a picture might be blemishes or faults in a photograph. The aim and object of pictorial art must be to idealize, to paint nature not as she is seen at any particular time, but as she *might* appear under such circumstances as would most conduce to the effect of, and aid in developing the impressions intended to be conveyed by the picture. Hard lines and unpleasing forms must be softened, lights and shadows must be arranged and subdued, and the whole subject be so composed and treated as to produce a harmonious whole; this being of far more importance than mere transcription of detail. In a good photograph, the reverse of this must necessarily be the case, its chief beauty and value will consist in the exactness, and distinctness, with which the objects it may represent, even to the finest details, may be rendered. Much of the beauty of a photograph as a picture must depend on its light and shade; the greatest care should therefore be taken, and judgment exercised in selecting the objects and determining on the most advantageous position and aspect in which they can be taken.

These remarks are borne out by the present Exhibition, particularly in the examples from life, consisting of portraits, groups, and animals. The success of portraiture must depend on

the skill with which the expressions and characteristics of the sitter are expressed in the picture, rather than on the mere copying of feature, in these beauties must be brought out, and defects subdued. In a photographic portrait good expression is invariably wanting; this is unvoidable, the sitter must, for however short a time, assume a fixed attitude both in form and feature. The picture will therefore be only a portrait of one phase of expression, generally of a very sombre nature, or when a smile is called up for the occasion, resulting in a meaningless grin. Though photographic portraits must be likenesses they are invariably unpleasing.

The collodian portraits exhibited are generally indifferent specimens of the art, the most successful, however, are those executed by Geo. Latham, Esq. The specimens contributed by J. Tawse, Esq. are much too sombre in tone. In the Portraits by W. E. Cochrane, Esq. the back grounds do not contrast sufficiently with the flesh tints, and consequently the pictures have a poor effect. The animals photographed by the same gentleman are remarkably good.

Some very characteristic groups of Figures, well taken, are exhibited by Dr. Scott.

The groups by A. Williamson, Esq. are good, especially " the Girl's School." J. Rowe Esq. exhibits some Daguereotype Portraits, that are very successful, being unusually free from the metallic appearance observable in Pictures taken by this process.

Passing from these to the examples of Landscape Photography, it would appear that (owing to the difficulty of focusing any extensive view so as to preserve the aeriel perspective, and render the foreground, middle and extreme distances with effect, to the absence of colour, and to the heaviness of appearance invariably observable in Photographs,) these subjects are not, if considered as Pictures alone, the most successful; but as studies for casual effects, light and shade, Perspective, Foliage and details applicable to foregrounds they are invaluable. If in the highest departments of Art Photography cannot compete with painting, its inferiority, in that respect is amply compensated for by its success in delineating such subjects as appertain to the more mechanical branches. No amount of graphic skill, or expenditure of time and patience could produce such marvellous delineations as are comprised in the examples executed from Architectural works, Microscopic and other objects.

The greatest strength of Photography lies, and is likely to lie, in its perfect applicability to such subjects; its value for scientific purposes in Architecture, Botany, Minerology, Anatomy, &c., is incalculable.

The contributions by Capt. Tripe, Capt Greenlaw, J. Mitchell, Esq. Dr. Murray, Dr. Mantell and others, show the great importance of Photography in representing objects so well adopted to the art as the subjects chosen by those exhibitors.

The Architecture of India was until the publicatiou of Mr. Fergusson's work on the Temples, and the Chapters devoted to the subject in his " Hand Book," almost unknown and unstudied, and, although much has been accomplished by him, in recording the History, grouping the styles, and illustrating the superb Buildings existing in the country, there must still remain much to be studied, and much to be illustrated. The series of views by Capt. Tripe are remarkable not only as excellent photographs, but as examples of the Burmese style of Building and ornament. The elaborate wood carving pictured in some, bears a striking resemblance to the later Rennaisance styles the ornament on a Balcony No. 95 both in arrangement of lines and general treatment being almost identical with them.

The views by Capt. Greenlaw from the magnificient ruins at Humpy are most valuable illustrations of Hindu Architecture with its multitudinous details. Many of them are also fine studies for light and shade, and perspective.

It would be supposed from the nature of Photography that all pictures executed by its means must possess a similarity of style; it is however a curious fact, that this is not the case, the works by one operator being perfectly distinct in character from those by another, even when the same description of apparatus and the same process has been used; this may be observed, when two pictures have been taken by different exhibitors from the same view—the best Indian Photographs in the Exhibition, those by Capt. Tripe and Capt. Greenlaw, exemplify this in a marked manner. The views by Capt. Tripe excel in finish and delicacy—those by Capt. Greenlaw in boldness, freedom and effect, the former are perhaps the best photographs, but the latter are the best pictures.

The Calotypes taken in Burmah and exhibited by Capt. Tripe are excellent; remarkable for great distinctness and also for their unusual and beautiful tint. When all are so excellent it is difficult to particularize any as especially

worthy of notice, at the same time Nos. 61 and 104 as specimens of the Landscapes and Nos. 43, 85, 92 and 95, as examples of the buildings and details may be designated as very good.

In No. 85 the perfection with which the elaborate carvings on the Balcony and cornices are brought out, is perfectly marvellous. No. 92, part of the Balcony of Kyong No, is remarkable both as regards the beauty of its detail and the picturesqueness of its effect. The Balcony No. 95 is a very fine example of ornamental treatment; and is photographed with the greatest delicacy.

The Views by Capt. Greenlaw taken near Bellary and at Humpy exhibit great boldness of style, the subjects are well chosen and many of them are superb studies of light and shade.

No. 9, a Tank and Garden, is remarkable for its beautiful atmospheric effect.

"The Cocoanut Tope," No. 18, is very good: No. 23, the Tank and River near Kistnasawmy Pagoda, is also a beautiful example.

No. 44, although a little indistinct in parts, is a very fine photograph, embracing a much larger field of view, than is generally attempted. Nos. 60 and 72 are good pictures, the distance in No. 60 is remarkably clear. Nos. 16, 19, 58, and 70, showing portions of the ruins at Humpy, are well worthy of notice; being well taken, having good pictorial effect, and affording fine examples of Hindu Architecture.

Dr. Neill exhibits some well printed specimens, but their effect is deteriorated by the dark reddish tint pervading them all, to a greater or less degree. No. 50 as a Landscape. Nos. 46, 52, 57, 58, 59, and 61 from Architectural details, are very good, especial Nos. 58 and 59.

The Calotypes exhibited by J. Mitchell, Esq., are good. The view of the Shevagunga Hill containing numberless buildings and objects, all distinctly delineated is especially so. Three views of the Ulsore temple at Bangalore are very good. The view of the Triplicane pagoda though effective, is injured by the spotty appearance observable in the water. Some smaller sized Photographs exhibited by W. H. Crake, Esq. are good; but it is questionable whether the tinted sky introduced in one example is in good taste, or not. The views taken at Agra by Dr. Murray are of large size, many of them being fine specimens of Photography. Nos. 344 and 438 from the Nynee Tall, are good subjects, well rendered. No. 381, the Palace Fort, is a good picture of a very picturesque object. The picture "Dead Deer. Himalaya" is remarkable for fine effect. Dr. Mantell exhibits some smaller views that are good both as to the choice of subjects and execution. No. 163 is a beautiful little study. Nos. 160, 165, and 487, are also worthy of notice, being well photographed and printed. W. Glyn, Esq. exhibits some very good examples, taken from subjects selected with great taste.

The views by Capt. Simpson are of small size and are principally remarkable for the taste and descrimination evinced in the choice of subjects, many of them being of a very homely character. Nos. 226, 232, 233, and 299, are most artistic studies.

The Daguereotype Landscapes by J. Rowe, Esq. are also very good. The "panoramic views of Calcutta" and the views of the "River Hooghly with shipping" are very perfect. Dr. Scott has contributed a series of excellent copies from Engravings. The copies of Engravings by J. Tawse, Esq. have the same defect as the Portraits exhibited by him.

Some good copies of Engravings are exhibited by C. Lazarus, Esq., and some successful Photographs from Microscopic objects by Dr. A. A. Mantell.

Of the system now prevailing of colouring Photographs, either with oil or water colour, there are one or two examples and these are inferior specimens, but it may be remarked that they, and all works of that kind are neither good as pictures or photographs, as pictures they want the very life of painting, drawing, and as Photographs, the beauty and exactness constituting their greatest charm is entirely lost in the colour with which it is overlaid.

Amongst the Photographs executed in Europe there are several good examples of Portraiture, especially the "Portrait of a Lady," contributed by Col. Denison. This is by far the best Photographic Portrait exhibited, being remarkable for the artistic arrangement of the drapery, and for the beautiful manner in which the light and shade are distributed.

The "Portait of a Gentleman" by Major Mayne is also very good. Two magnificent specimens are exhibited by E. Maltby, Esq., one being a study of sea and sky, the other a view of a portion of the Hotel Richelieu; the former is perfectly wonderful as an example of Photographic art, particularly as from the nature of the subject it must have been taken instantaneously; the latter is of great size, of good colour, and very distinctly taken, the

paper notwithstanding its dimensions appearing perfectly free from flaws.

Some views in Edinburgh by W. Walker, Esq., and also two by Thunny of the same city, are worthy of notice; a few good views in Ireland are also exhibited, and a series exhibited by Colonel Denison consisting of views in Venice.

The Oil Paintings exhibited are few in number and indifferent in execution; Capt. Cazalet's two pictures representing views in Penang are carefully painted, but are ineffective and wanting in breadth.

Of the two pictures by Mr. G. W. Novice the still-life group (dead birds) is by far the best; the group of flowers sent by him is poor, both in drawing and colouring.

Two or three Portraits in oil colour are exhibited.

The collection of water colour and other Drawings is more numerous. Some beautiful specimens of Delhi paintings are contributed by Lord Harris; these are remarkable for their minuteness and for exquisite finish in drawing and colouring.

Two drawings exhibited by Geo. Latham, Esq.. are excellent, combining good execution and finish as architectural drawings, with clever arrangement for pictorial effect; the figures introduced are well grouped and drawn with great spirit, the skies being also well painted.

W. H. Porteous, Esq., exhibits two single portraits and two groups. These drawings, executed in crayon and water colour by M. Serr, of Berlin, are in part very good. The effect of the groups, as pictures, is much injured by the stiff manner in which the figures are posed.

The two drawings exhibited by Capt. Rawlins, executed by Capt. Nicholls, representing the "Temple of the Sun" and the "Astec Tank," though well drawn, are too uniform in colour, and are very theatrical in treatment.

A series of Drawings from Flowers by Mrs. Col. J. R. Brown are worthy of notice; they are excellent as botanical studies, very characterestic, and true to nature, being also well drawn but requiring more finish in colouring, especially in the larger leaves. A set of Paintings on Talc, representing Native Figures, exhibited by G. Mooroogasen Moodeliar, are remarkable for careful execution and finish.

Other Drawings are exhibited that do not call for any special notice.

Some French Engravings are exhibited by Mr. Deschamp.

The Government School of Arts contributes a number of Engravings and Lithographs, amongst them a series of Architectural details, comprising measurements of the Ancient Buildings in Rome by G. Marshall, Architect, engraved by Ant, Desgodetz.

Awards recommended by the Sub-Committee in the Jury on Class XXX, reporting on Pictures, Drawings, Photographs, and Engravings.

First-Class Medals, Madras.

"George Latham, Esq.,for his excellent Architectural drawings.

"Capt. Tripe, for his series of Calotypes, illustrating Burmese Architecture and Ornament.

"Capt. Greenlaw, for his series of Calotypes, illustrating Hindu Architecture.

"Dr. Scott, for his Photographs from groups of figures, and from engravings.

"Mrs. Colonel J. R. Brown, for her series of Water-colour Drawings, from Indian Plants.

Calcutta.

"Dr. Murray, for his Photographic views taken at Agra.

"Capt. Simpson, for his series of views, and for the taste evinced in the choice of the subjects from which they they have been taken.

"Dr. Neill, for his Photographs of Architectural subjects.

"J. Mitchell, Esq., for his series of Photographic views.

"Major Mayne, for his Photographic Portraits.

"Dr. Mantell, for the Photographic views and the Photographs from Microsopic objects executed by him.

"J. Rowe, Esq., for his Daguereotype Landscapes and Portraits.

Honorable Mention.

The Right Honorable Lord Harris for the beautiful specimens of Delhi paintings exhibited by him.

"E. Maltby, Esq., for the two European Photographs exhibited by him.

"Col. Denison, for the Portrait of a Lady and the Photographic views of Venice exhibited by him.

A. COLE,

Reporter.

SUB-JURY.

BRONZES, MARBLE, ALABASTER, AND PARIAN STATUETTES, PLASTER CASTS, &c.

G. ELLIS, Esq.

Captain HAY.

ALEX. HUNTER, Esq., *Associate and Reporter.*

There is a large collection of articles in this class, some deserving of notice from their antiquity, others from their quaintness of form, a few from the excellency of their workmanship or from their being copies of celebrated works of Art from the best galleries of Europe.

BRONZES.

There is a fair display of Bronzes from France, Italy, Burmah, and China. The best collection is the joint contribution of the Honorable Walter Elliot and J. Vans Agnew, Esq. In this series are some very spirited and excellent samples of modelling, particularly two horses by J. Mene; the animals by this artist are always remarkable for their careful anatomical modelling and spirited action: some of the best table ornaments of modern times are his groups of deer, horses, and dogs.

An excellent and humorous bronze from the same collection is an old Mastiff and a Tortoise by A. Jackquemart. There is a great deal of character in the old dog, who seems to be intensely interested in the movements of the small tortoise, creeping under his old nose; the texture of the skin and the anatomy of the dog are admirably rendered. A copy of the Mercury by John of Bologna exhibits good modelling, and the color of the bronze is dark and rich. A Dancing Peasant or Reaper is awkwardly posed and ungraceful in action. The bronze is also inferior in quality, being pale and brassy green in tint. A copy of an antique Vase with groups of Cupids is well executed and tasteful in form. In the same collection are some copies of Neapolitan Vases in bronze from the Borbonico Collection. These are mounted on plain marble stands and are remarkable for their simple elegance and purity of form. The Honorable Walter Elliot exhibits some interesting bronzes from Burmah, amongst which are a reliquary in the form of a Paha or Deghope, found at Tonghoo; it contained some reliques in the cavity at the top which was made to open for the purpose of receiving them. A Burmese Gong, Mirror, Combs, and set of Scales and Weights were also interesting.

Mr. Deschamps exhibits two bronze Statuettes by Pradier, rather insipid in sentiment and deficient in anatomical modelling. A Boar Vase, a Cup with a child and dog, and an Egyptian Cup, are more appropriate in style. Two small bronze figures of Soldiers of the Grenadier Guards are cleverly modelled and spirited in action. Mr. Burgass exhibits two bronze Japanese Candelabra of excellent metal, very plain in execution and simple in design.

Messrs. Oakes and Co. contribute two Chinese Bronze Vases on carved stands, both in bold perforated grotesque style, one ornamented with dragons and the other with the signs of the zodiac. These are of good bronze containing much copper, and are interesting from the skill which they exhibit in modelling, casting, and chasing of intricate patterns. Samples of this kind show great progress in a difficult branch of metallurgic Art. It is much to be regretted that there are not any specimens of Indian Bronzes, as it is known that good figures and ornaments in bronze and copper are to be met with in this Presidency, though the Art is rapidly deteriorating in India from the want of encouragement. A few of the samples of bronze, copper, and brass forwarded to the Exhibition of 1855 proved that the Natives excell in the chasing and mechanical details of this and other branches of metallurgic Art, which might easily be improved in India.

MARBLE AND ALABASTER BUSTS; STATUETTES, AND TABLE ORNAMENTS.

A pair of fine colossal Busts in marble of Bacchus and Ariadne are exhibited by Mr. Deschamps. These are copies from the antique in good Italian marble on colored marble pedestals. The style is broad, simple, and effective without much detail. The vine leaves on the head of Bacchus are rather large and heavy; the Ariadne is the more pleasing bust of the two.

Mr. Deschamps exhibits also a statuette in marble of a young Apollo, and a recumbent female figure in grief, apparently intended for a monumental tablet. The drapery of the latter is in bad taste and the figure indifferently modelled. In the same collection are small alabaster statuettes of Narcissus, Diana at the Bath, Canova's Three Graces and a Tazza supported by three female figures; the latter is in bad taste, the nude female figure being tamely and inappropriately applied partly as a support but without any attempt at artistic adaptation of the figures, the backs of which are all shown in

the same attitude. A small eopy in alabaster of the Daneing Faun, from the Vatiean, the head and arms of whieh were restored by Miehael Angelo, is one of the best statuettes exhibited by Mr. Desehamps.

A reelining figure of Gordama, the Burmese Buddha, is earved in a very translucent but hard marble; there is little attempt at anatomieal modelling or aecurate ehiselling of details, and a total negleet of graeeful forms either in the figure or in the folds of the drapery, smoothness of surface and high polish being the chief points aimed at by the Burmese seulptors, who carve two or three of their deities invariably in the same attitudes. This marble is apparently well suited for statuary purposes, and as the Burmese carve with great rapidity and freedom, it might be worth while trying if they eould be indueed to eopy good ornaments or works of Art in marble or alabaster, both of whieh are known to be abundant in Ava.

Carvings in Stone.

Two of the best speeimens exhibited in this class are large ornamental Flower Vases earved in Maltese white sand-stone. These are remarkable for the aecurate precision in the ehiselling of the details, and the appropriate applieation of ornament; the forms of the vases are elegant, but the details are a little crowded in some parts of the vases. The Jury reeommend a Seeond Class Medal to Messrs. Griffiths and Co., the Exhibitors.

Parian Statuettes.

There are but two speeimens of Parian, contributed by Messrs. Griffiths & Co., Cupids fighting for a heart and Pomona with the apple; the former is a spirited pieee of modelling, with good and appropriate aetion in the figures and eareful finish of details. The latter is rather eommon-plaee in attitude, smooth and defieient in detail as if from a worn-out mould. An elegant alabaster vase is exhibited by Griffiths and Co.

The Honorable Walter Elliot eontributes four slabs of greyish marble, one carved with Hindoo figures in bold relief; another with an equestrian figure and a seated female, well carved. The third is a rosette formed of the Lotus flowers, with the saered feet in the centre. These three are from the ruins of Amravattee in Guntoor. The fourth is an ornament earved in low relief inelosing the signs of the zodiae. This stone is from Cashmere and bears the marks of great antiquity. The Guntoor loeal eommittee exhibit a large stone that formed the top of a Hindoo Sath, at Amrawattee, and belonging to the series of Elliot seulptures at the Museum. Attempts were made to procure for the Exhibition some interesting slabs that formed the roof, or eovering, for some of the old tombs or eromleehs filled with antique Pottery, discovered reeently near Coimbatore by S. Fraser, Esq., Civil Engineer. These stones were upwards of six feet in length and three in breadth, and earved on the under or inner surface with Hindoo figures. The stones, however, eould not be proeured in time for the Exhibition.

The Honorable Walter Elliot also exhibits a horn of the Afriean Rhinoeeros (R. Cyums) lately carved in China. The pattern eonsists of aquatie plants and birds boldly and sharply undercut.

Plaster of Paris Casts.

There is a large eontribution of Statues, Busts and Plaster Studies from the Madras School of Industrial Arts, eonsisting of easts from some of the best works of Art in the Galleries of Rome and the British Museum. Among these may be remarked the full length Statue of a eombatant, usually ealled the Fighting Gladiator. This figure is full of energy and sudden museular aetion, leaning forward as if in the aet of delivering a blow. It is a fine example of anatomieal modelling and of eareful finish of details; the eharaeter of the head is in good keeping with the rest of the figure. The original was found at Antium and is by Agasias, a Greeian sculptor. The Dying Gladiator, from the Capitol at Rome, is also a fine work of Art, expressive in attitude and truthful in eharaeter, but not so perfeet as the previous figure, the left leg and one of the hands being inferior in exeeution, probably from being modern restorations; it is not known by whom the original was exeeuted.

The Venus of Milo is a fine example of Greeian Art in its best period; it eombines ease and graee of attitude with bold, yet refined execution: the original is supposed to have been exeeuted by Praxitiles.

It is to be regretted that an aecident befel one of the best statues sent to the Exhibition, viz., the Athlete with the Strygil, presented to the Sehool of Arts by the Roman Government.

The statue was broken after having been set up, and could not be repaired in time for the opening of the hall. The pedestal was

in consequence occupied by a colossal head by Phidias, from Monte Cavallo. This head has all the character, action, and expression of the head of the Apollo Belvidere, but has been much weather-worn and destroyed from exposure.

The collection of Busts from Rome contains two of a colossal size of the Emperors Septimus Severus, and Lucius Verus, from the Borghese Collection, both in a fine style of Art, combining boldness of chisselling with careful finish of details. A bust of Juno is in a broad, severe style, Busts of Cicero and the young Emperor Augustus are fine samples of careful modelling and expression. The collection of colossal and other hands and feet are well selected as studies for Schools.

The Madras School of Arts also contributes a complete series of casts from the Elgin Marbles in the British Museum, constituting about two-thirds of the Panathenaic Frieze with which Phidias embellished the outside of the Temple of the Parthenon at Athens. The subjects are the processions celebrated every fifth year in honor of Minerva; they consist of different compartments containing draped male and female figures, some walking slowly in procession, others bearing offerings, and leading animals to be slaughtered, a few sitting figures, two processions of charioteers in Bigas, and two long equestrain processions. There are in all 254 figures, 1C3 horses and a few animals, about half the size of life, grouped and arranged with such simplicity, taste, and elegance as is not to be found in any works of a similar character now extant. The slabs, which amount to 82, cover a space of 249 feet, and over this extent is a life, activity, and grace, with a variety of attitude, costume, and animated action, which prove that the Grecian sculptors possessed a thorough knowledge of the human form, and a just appreciation of those actions of the body, delicate as well as violent, which give expression and character.

The draped female figures are remarkable for simplicity and elegance in attitnde, with graceful disposition of the drapery. The male figures have a dignity and ease of action seldom attained in statuary, and there is an animation, life, and motion in the equestrian procession which prove a thorough mastery of the arts of modelling and sculpture. These casts were selected as the best and purest samples of high art that could be procured for comparison with some of the sculptures of India, which, though often excellent in ornament and rich in mechanical details, are deficient in the modelling of the human figure, which in Hindoo Art is usually over strained in action, and stiff and uneasy when in repose.

ALEX. HUNTER, M.D.,

Reporter.